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JOURNAL
of
FARM ECONOMICS

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PROCEEDINGS
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of
THE AMERICAN FARM ECONOMIC ASSOCIATION

AUGUST 23-28, 1959
CORNELL UNIVERSITY
ITHACA, NEW YORK

1959-60—THE FIFTIETH YEAR

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THE AMERICAN FARM ECONOMIC ASSOCIATION
Volume XLI DECEMBER, 1959 Number 5

THE AMERICAN FARM ECONOMIC ASSOCIATION

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Price: \$9 per year, this issue \$2.00

Entered as second class matter at the post office at Menasha, Wis. Acceptance for mailing at a special rate of postage provided for in the Act of February 28, 1945, paragraph 4, section 412, P.L.&R., authorized November 27, 1931. Printed in U.S.A.

THE JOURNAL OF FARM ECONOMICS is published five times a year during February, May, August, November and December by The American Farm Economic Association. Yearly subscriptions \$9. Published at Menasha, Wisconsin.

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FELLOWS
of the
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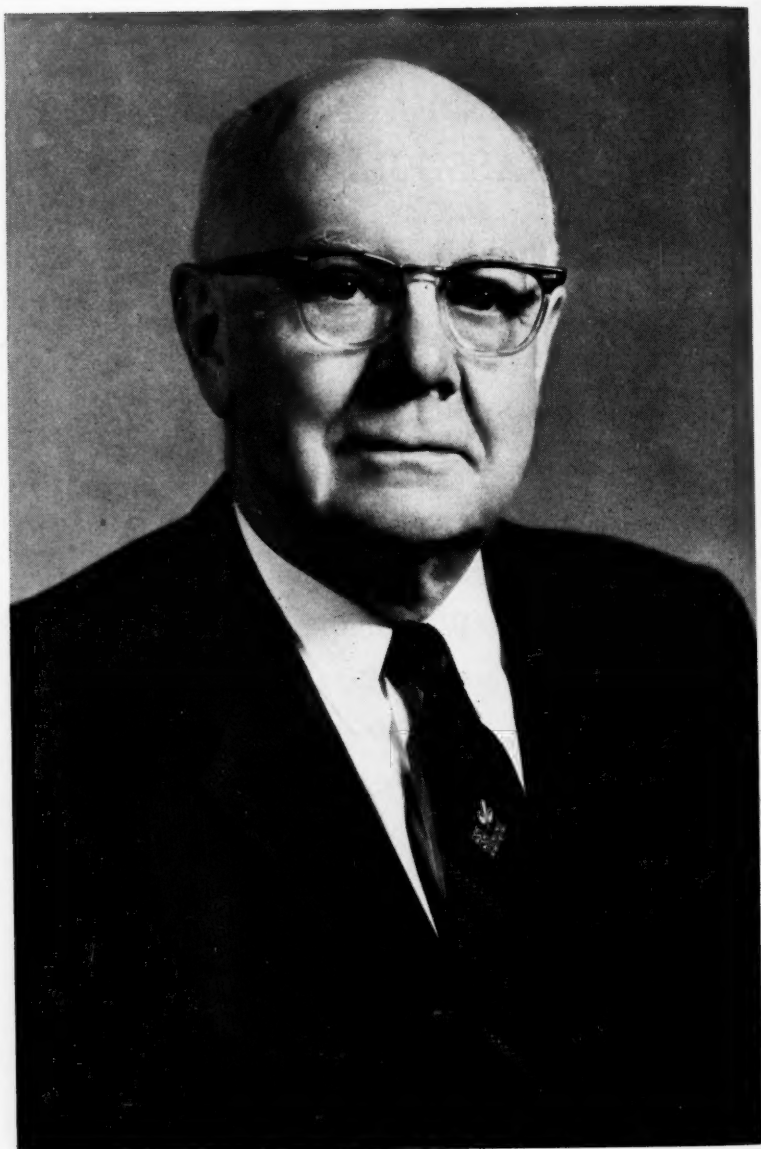
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ELECTED 1959

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OSCAR CLEMEN STINE



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HAROLD CLAYTON M. CASE was born near Dunlap, Illinois, March 1, 1890. In 1912 he completed his B.S. degree at the University of Illinois with a major in animal husbandry. He remained there as an assistant in animal husbandry for one year.

To gain practical experience he managed a pure-bred livestock farm for two years before returning to Illinois as an extension specialist in farm management and two years later, while retaining his farm management appointment, became assistant state leader of county agents. In 1919 he was placed in charge of federal farm management extension in the 33 northern and western states for two years while on leave from Illinois. He received his M.S. degree from the University of Illinois in 1919 and later took graduate work in agricultural economics at Wisconsin and Cornell, receiving his Ph.D. degree from Wisconsin in 1931.

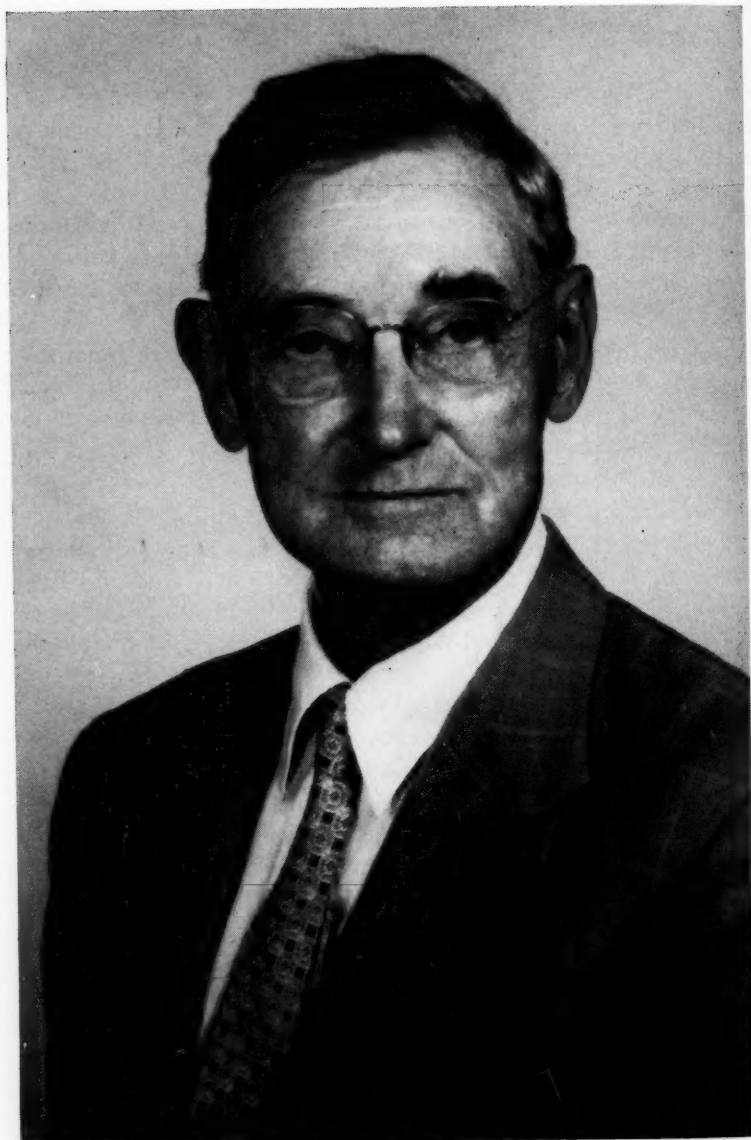
In 1922 he became acting head and later head of the Department of Farm Organization and Management at Illinois. He was appointed head of the newly organized Department of Agricultural Economics in 1934 and held this position until 1955, when he asked to be relieved of administrative responsibility in order to devote half-time to the secretary-treasurership of the International Conference of Agricultural Economists. He continued to serve both the International Conference and the University until his retirement in 1958. His major subject matter interests included farm management, land tenure, farm policy, farm appraisal, and farm credit. He was author or joint author of two books and of many bulletins, circulars, and articles.

His nonacademic career provided many broadening experiences for the administration of the Department of Agricultural Economics at Illinois. In addition to his federal position in farm management extension, he took a number of short leaves of absence.

In 1933-34 he served as assistant to the governor of the Farm Credit Administration in charge of the voluntary farm debt adjustment work, an emergency service organized in more than 2,500 counties. Later he was a director of the Farm Credit Administration in St. Louis for four years. He spent some time in London in 1944-45 as chairman of the statistical group of the combined Working Party on European Food Supplies for the United Nations Relief and Rehabilitation Administration, which was concerned with determining the available food supplies in Europe. He went to China in 1946 as a member of an American-Chinese mission to study agricultural problems under the auspices of the U. S. Departments of State and Agriculture and the Chinese Nationalist government.

In 1947-48 he served as consultant to both the Senate Subcommittee on

(Continued on page vi)



OSCAR CLEMEN STINE

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OSCAR CLEMEN STINE was born in Jackson County, West Virginia, in 1884. He received his Ph.B. degree from Ohio University in 1908 and his Ph.D. from the University of Wisconsin in 1921. He also studied at Chicago and at Harvard.

His 37 years of association with the Department of Agriculture began in 1914 as a collaborator at the University of Wisconsin. He came to Washington in 1916 as an economist in the Office of Farm Management to do historical research for an Atlas of American Agriculture. This project was never completed, but it led to the development of the Statistical and Historical Research Division of the Bureau of Agricultural Economics in 1921. As the first head of this division Stine standardized statistical procedures and developed statistical methods for dealing with the economic problems of agriculture. In 1946 he was appointed Assistant Chief of the Bureau in charge of prices, income, and marketing.

Under his direction, the work of the Bureau in the construction of price indexes, the measurement of price, income estimation, outlook work, and agricultural history gained national and international recognition.

Probably Stine's greatest achievement was the development of a capable analytic staff—through emphasis on adequate economic and statistical training, a scientific attitude, and historical perspective. He was generous in his encouragement of the diligent and imaginative, but had little patience with the indolent or the pretentious. He was interested fundamentally in men and ideas, and had small regard for efforts to organize the study of agricultural economics into a series of neat bureaucratic subdivisions. When faced with a problem, he drew on whatever men and resources were needed.

Deeply interested in the relation of foreign economic conditions to American agriculture, Dr. Stine established the first Departmental unit for economic analysis of foreign competition and demand and directed the work of several agricultural commissioners abroad. The information obtained was combined with U. S. statistics to provide information regarding world market conditions. This service was extended with the cooperation of the Department of State and the International Institute of Agriculture and led eventually to the establishment of the Foreign Agricultural Service. Throughout the years, Stine represented the Department at numerous international conferences relating to agriculture and statistics.

He was Editor of the *Journal of Farm Economics* in 1922-24, and President of the American Farm Economic Association in 1931. He was a charter member of the Agricultural History Society, serving as President in 1924-25 and as the first Editor of *Agricultural History* during the years 1927-31. He was elected a Fellow and Vice President of the American

Statistical Association in 1939. He was a member of the Central Statistical Board organized in 1933 and served some time as Vice President. For many years he was a member of the National Income and National Price Conferences of the National Bureau of Economic Research and also a member of the Council on Foreign Relations. He represented the American Statistical Association through two terms on the Social Science Research Council.

Stine's contributions continued after his retirement in 1951. He served as Associate Research Director of the Twentieth Century Fund study of government farm programs, and briefly as Senior Specialist on Agriculture in the Legislative Reference Service of the Library of Congress. He has taught at the University of Florida, Hampton-Sydney College, and Southern Illinois University. Meanwhile, he has continued to operate his 120-acre farm in the Shenandoah Valley near Shepherdstown, West Virginia.

HAROLD CLAYTON M. CASE

(Continued from page iii)

Agricultural Appropriations and the Senate Committee on Agriculture and Forestry.

A charter member of the International Conference of Agricultural Economists, he attended the initial conference in 1929 and a majority of the subsequent conferences, was a member of its council, and served during the past four years as general secretary-treasurer of the group. He was President of the American Farm Economic Association in 1930 and Editor in 1936 and 1937.

In addition to serving on many committees of the University of Illinois, he was active in the organization of and served in an official capacity in the Illinois Society of Farm Managers and Rural Appraisers as well as the American Society of Farm Managers and Rural Appraisers. Both organizations have honored him with special citations, including the D. Howard Doane Award by the latter organization in 1958.

JOURNAL OF FARM ECONOMICS

Volume XLI

DECEMBER, 1959

Number 5

FARM TECHNOLOGY, FOREIGN SURPLUS DISPOSAL AND DOMESTIC SUPPLY CONTROL*

WILLARD W. COCHRANE**

University of Minnesota

I

IN THIS paper, I want to do three principal things: (1) describe and dramatize the technological revolution in American agriculture together with its surplus implications; (2) describe the pre-eminent role that foreign surplus disposal has assumed in domestic agricultural policy together with its potential role; and (3) argue the necessary linkage of effective supply control to foreign demand expansion, if good and stable incomes are to be realized on representative farms in the United States. In other words, it is the thesis of this paper that advancing technology in American agriculture is forcing, first, the acceptance of foreign surplus disposal and second, the acceptance of comprehensive supply control. And the logical result must be the integration of—the marriage of—these seemingly opposing lines of action into a unified policy. And it is the purpose of this paper to record—to legitimize—this marriage of foreign surplus disposal and comprehensive supply control, however distasteful it may be to some friends and relations.

II

Total farm output increased just about 50 per cent between 1940 and 1958. This is a substantial increase, but not a really spectacular one when compared with some other growth rates in the American economy since 1940. But when this output increase from agriculture is compared with population increases, the shades of the picture change rapidly. During the

* Address of the President-Elect, American Farm Economic Association, August 24, 1959.

**The author wishes to acknowledge the helpful criticisms and suggestions made by his colleagues Sherwood O. Berg, Lee M. Day, Elmer W. Learn, and Philip M. Raup. Errors of fact, judgment or logic are, of course, the responsibility of the author alone.

decade of the 1940's, total farm output increased approximately 2.2 per cent per year, as total population in the United States increased some 1.5 per cent per year.¹ Clearly farm output was outracing population growth in this decade, but since we were fighting a world war and helping the world recover from that war this development turned out to be a blessing. We made the world food and fiber needs our needs during the decade of the 1940's, hence we could use to advantage all the product that we could get.

During the 1950's total farm output has increased approximately 2.5 per cent per year, as total population in the United States has increased some 1.8 per cent per year. Population growth speeded up in the 1950's, but so did the rate of output expansion. At the present writing, the aggregate output of agriculture is outdistancing a very rapid rate of population growth in the United States by more than one-half of one per cent per year. And where the income elasticity of raw farm products approaches zero, as is the case in the United States, this imbalance can be disastrous. Where the income elasticity of raw products approaches zero, the excess rate of output expansion over population growth properly measures the additional pressure of supply on demand each year, hence measures the increased downward pressure on farm prices (or, under price supports, the widening of the annual rate of surplus).

And the surpluses have mounted. Of this development the Secretary of Agriculture has kept us well informed. The U. S. Department of Agriculture's investment in storable stocks has increased persistently—from under 2 billion dollars in fiscal 1952 to an estimated 9 billion dollars in fiscal 1959. And this build-up of stocks has occurred in the face of really massive export programs—programs that have moved between 1.5 and 2.0 billion dollars worth of agricultural commodities, in addition to conventional commercial sales, in each of the last four years.² Think where Mr. Benson's stock pile would have been (or where farm prices could have been) without this volume of foreign surplus disposal. Further, this mounting stock pile is not limited to wheat and cotton; it is now heavily weighted with feed grains, which we all recognize as unprocessed livestock and livestock products. In sum and in short the surplus condition is general; the mounting surplus in feed concentrates makes it so.

Now what has pushed the rate of output expansion ahead of population growth by .6 to .7 of a per cent per year? Basically it is the rapid and widespread application of new knowledge to agriculture—new knowledge that is expanding output faster than offsetting adjustments can be made in the

¹ These percentages and the comparable ones in the following paragraphs are simply the 10 year percentage changes divided by 10.

² See the outlook issues of the *Demand and Price Situation* for the relevant data.

way of reducing the employment of other factor inputs in agriculture, notably labor. The rain of new knowledge across the land, the technological revolution sweeping over agriculture, is not a narrow thing tied to machinery and equipment—it is a broad thing involving improved skills in labor and management, the relocation, recombination and area specialization of commodity enterprises, and the farm adoption of new techniques. All of these avenues of new knowledge application, acting and interacting, are raising production functions, lowering cost functions and expanding output in agriculture.

Preliminary estimates from the U. S. Department of Agriculture suggest that total inputs in agriculture increased about 10 per cent between 1940 and 1958. Total inputs increased 10 per cent, while total output increased 50 per cent. And since I have seen no evidence of increasing returns to scale in agriculture, after the obvious smaller-than-one-man unit is passed (in fact all the evidence that I have seen suggests constant returns to scale) the interpretation of the above data must be (1) that 20 per cent of the increase in total output since 1940 is explained by an increase in inputs and (2) 80 per cent of the increase is to be explained by technological advance in the broad sense outlined above.

There is, however, a new school of thought emerging, or perhaps an old school gaining a new lease on life, with respect to the employment of resources in agriculture. Briefly it says that up to 60 per cent of the increase in output since 1940 is to be explained by an increase in total inputs in agriculture. The disagreement seems to revolve around the different views held with respect to proper rates of depreciation for farm machinery and equipment. Hence, we may anticipate a battle of input indexes in the years to come.

Although this second view of total input behavior in agriculture dampens down somewhat the technological-advance thesis of certain earlier writings of mine, it in no way subtracts from the technological-revolution thesis of this paper. In both views the aggregate input of labor in agriculture has declined drastically since 1940—by more than 35 per cent. Inputs of land have held fairly constant. And inputs of new kinds of non-farm capital have increased dramatically. In both views, new and improved capital items have substituted for labor, but in the second view a considerably larger quantity of capital was required to obtain the output increase that did occur than in the first, or Cochrane, view. The only question at issue is—how much additional capital was required?

Thus, the ideal construct that I wish to leave with you is the following—new knowledge flows into agriculture in many ways: in the form of developed machines and techniques to be adopted, in the form of new enterprise combinations (i.e., industry relocation and specialization), and in the form of increased labor and management skills. Now the first two of

these will be adopted, or instituted, as rapidly as they become available and as rapidly as labor and management skills permit. They will be adopted in the pure substitutional case of capital for labor to realize the increased labor-management returns to those persons remaining in agriculture. They will be adopted in the pure technological-advance case first to realize the enhanced profits on the part of the early adopters and second to reduce unit costs on representative farms as product prices fall with expanding supplies. And they will be adopted, or instituted, in practice for a combination of the above two reasons. The incentive to apply new knowledge is there: it is powerful and ubiquitous in American agriculture.

The question may be asked at this point—will the new knowledge and the new technologies continue to pour forth at a rate that pushes output ahead of demand? This question is most often asked by persons taking a narrow view of the technological revolution in agriculture—persons who tend to view advancing technology in terms of machines and equipment. But this I would argue is a too limited—in fact an erroneous—view of the technological revolution in American agriculture. A more correct view, I believe, is that of a broad front of new knowledge flowing into agriculture. Sometimes this new knowledge takes the form of new machines and equipment, but it also takes many other forms. It takes the form of new and improved disease control, improved pest control, improved water control, and new and improved breeds and varieties. It takes the form of upgraded labor skills—labor that can handle the newer practices and that can see the place for still different and improved practices. It takes the form of improved management skills that lead to the relocation, recombination and further specialization of enterprises. And this advancing front of new knowledge is now fed by many streams besides the Land Grant Colleges; it is fed to an increasingly greater degree by private industrial research; and it is becoming an important beneficiary of the large-scale, post World War II research efforts in physics, genetics and biochemistry; this is serendipity on a grand scale. Thus, I can find no reason to anticipate a slowdown in the flow of new knowledge into agriculture. On the contrary, I believe that research and development in agricultural production is running into external economies of scale—is running into and is being fed by the fruits of research in the more basic disciplines (e.g., physics and biochemistry).

In sum, and as I see it, useable knowledge and new and improved production practices and processes are going to flow into agriculture in increasing abundance. I suspect that we are on the threshold of the technological revolution in agriculture, not in the middle or latter stages of it. If given half a chance I can become a real Buck Rogers with respect to the

future of agriculture: the feed supply produced in factories employing artificial photosynthesis processes, the sea intensively farmed to yield protein supplies, and animal products produced under controlled conditions such as we are now beginning to see in poultry.

And as we have observed, the incentive to substitute capital for labor and to adopt cost-reducing practices on farms is there. Unless we destroy asset positions of farmers generally by putting them through the long-run wringer of a free market they are going to continue to substitute capital for labor and to expand output. The twin pressures deriving out of the technological revolution in agriculture—the pressure to move labor out of agriculture and the pressure of the food and fiber supply on population—are going to remain with us and intensify because the technological revolution in agriculture is going to remain with us and intensify.³ The great policy problem of American agriculture in the 1950's and in the decades to come is that of finding a way to moderate those pressures and make them tolerable to the people living under them—namely, farmers.

III

Agricultural exports moving under some kind of special governmental programs amounted to between 60 and 70 per cent of total agricultural exports from the United States in the post World War II years, and continued at these high levels through the hot Korean action. But in the early 1950's—in the first years of the cold war—agricultural exports under special programs fell off sharply; such exports fell from a dollar value of 1.2 billion in 1950-51 to 0.5 billion in 1952-53. This new low level of special-program exports held, however, for only one year. In 1953-54 agricultural exports underwritten by government began moving up, reaching a peak value of 1.9 billion dollars in 1956-57, but leveling off on a plateau of around 1.5 billion dollars in the late 1950's.

The low level of special-program agricultural exports realized in 1952-53 could not hold for reasons discussed above—namely, the pressure of food and fiber supplies on domestic population. Mounting surplus stocks following 1953 forced politicians and administrators to find a way of disposing of those stocks. And the way was found once again in the acceptance of the World's needs for food and fiber as our needs (or at least the needs of the non-Communist part of the World). The pressure of food and fiber supplies on population in the United States was moderated dur-

³ The writer was sorely tempted at this point to throw away the topic and outline of this paper, and explore in detail our unconscious policy with respect to the development and dissemination of new knowledge in agriculture—to explore the large and unknown resource commitment in research and education that is propelling the technological revolution in agriculture. But that is clearly the subject of another paper, which is taking shape in the writer's mind.

ing the late 1950's by massive surplus disposal abroad. To an important degree we exported our farm problem.

Now the cynic's view of the motives that led the United States to assume the "burden" of meeting the unsatisfied food and fiber needs of much of the world in the 1950's may not be wide of the mark, but recent efforts on the part of some individuals and agencies to analyze away that world need strikes me as being both fallacious and malicious. The need is there. The trained observer traveling through the Middle East and much of Asia cannot miss it; he does not have to await clinical examinations of the population to observe it; he can see chronic undernourishment with his own eyes. And the Food and Agriculture Organization has documented this need many times. Using estimates of per capita food consumption and requirements presented in the *Second World Food Survey*⁴ and world population estimates for 1956 I get a very rough estimate of the caloric gap of the non-Communist world, *measured in metric tons of wheat*, of some 30 to 35 million metric tons. (This, of course, is not to suggest that the caloric gap *should* be met with wheat alone; *metric tons of wheat* is simply used as a meaningful unit of measure here). This gap compares with annual wheat production in the United States of between 25 and 30 million metric tons, with the United States stocks of wheat in 1958 of 24 million metric tons and with the foreign surplus disposal of food and feed grains in 1957-58 of 10 or 11 million metric tons. The need is there and it is large, but it is not out of this world.

Further, it is now pretty clear that the caloric gap in the underdeveloped parts of the world is widening rather than narrowing.⁵ Per capita agricultural production in the underdeveloped areas of the world in the 1950's has not regained pre-World War II levels. Both the Far and Near East, which were formerly net exporters of agricultural products, are now net importers. This changed position in the underdeveloped countries is, of course, to be explained by the population upsurge in those countries. And the end of this mounting population pressure on food and fiber supplies in these countries is not in sight. Let me sum up and drive home the import of this deteriorating situation with respect to *per capita* food and fiber supplies in the underdeveloped countries by quoting from the recent Report of the Ford Foundation Agricultural Production Team sent to India to study the food crisis developing there. The Report reads as follows:

India is facing a crisis in food production. . . .

Five million persons per year were added during the First Five Year Plan,

⁴ Published by the Food and Agriculture Organization of the United Nations, Rome, November 1952.

⁵ See the discussion in *The State of Food and Agriculture 1958*, Food and Agriculture Organization of the United Nations, Rome, 1958, pp. 9-33.

and seven million per year will have been added during the Second Plan Period. Ten million per year probably will be added during the period of the Third Plan ending 1966. . . . This explosive increase in population will raise the total from 360 million in 1951 to an estimated 480 million by 1966.

Preliminary planning is now under way for the Third Plan. No specific targets have been announced, but discussions indicate that from 100 to 110 million tons of food grains will be required by 1965-66. . . .

In order to produce 110 million tons of food grains annually by the end of the Third Plan, the rate of production increase must average 8.2 per cent per year for the next 7 years. This rate of increase compares with an annual average of 2.3 per cent from 1948-53 to 1958-59. The task is overwhelming. . . .⁶

Although the food and fiber needs of the underdeveloped countries are great and becoming greater, and although the United States has acted to meet the most acute of these needs, it does not follow that the foreign surplus disposal programs of the United States have in any fundamental sense been good for the recipient countries, for foreign competitors, or for the United States. Many share this negative view; I share it in part myself. Our first efforts at surplus disposal in the 1950's were very crude. We turned our agricultural attachés into order takers; we sent huckster teams around the world to find new markets; we engaged in barter; we pushed our surpluses hard. How much these concessional sales cut into the export markets of such friendly nations as Canada, New Zealand and Denmark we will probably never know. Probably by not as much as was claimed. On the other hand, we were not careful of third-country positions in the mid 1950's.

But we have learned much with respect to the mechanics of foreign surplus disposal; we have become sophisticated dumpers. We now consult formally with the various export countries through the F.A.O. Consultative Committee on foreign surplus disposal, we consult informally with competing nations in the initiation and modification of disposal agreements with recipient countries, and we are firmly committed, in the Administration at least, to the "additional principal" (i.e., concessional sales, or grants, to a recipient country must represent *additions* to the regular commercial sales of that country).⁷ In short, we have made great strides in the way of improving the operation of surplus disposal programs *vis-à-vis* other nations; also the sale of food and fiber supplies for foreign currencies is a bright institutional innovation.

But there remain grave difficulties with our total foreign surplus dis-

⁶ *Report on India's Food Crisis and Steps to Meet It*, issued by the Ministry of Food, the Government of India, April 1949, pp. 11-12.

⁷ Strictly speaking, adherence to the "additional principle" is limited to sales for foreign currency under P.L. 480, and there is continued pressure to engage in barter and concessional dollar sales that are competitive; but there is a growing general awareness that the leader of the free world cannot dump at will on its friends.

posal operation—difficulties that in my opinion must be resolved if this course of action is to be pursued on a sustained basis with beneficial consequences to all parties concerned. These difficulties are highly inter-related, but gain in clarity, I believe, through separation. They are:

(1) The temporary, emergency quality of our foreign surplus disposal operations. Although everyone likes a bargain, there have, as yet, been few lasting benefits to the recipient countries involved. Current consumption levels have been increased; and this can be important to hungry people. But little else has been achieved. Economic development projects, for which currency received from the sale of food and fiber in the recipient countries has been set aside, remain to an important degree in the planning stage; disbursements of funds to finance projects lag far behind the planned use of funds. In short, our foreign disposal programs were conceived by this Administration as expedient, temporary, disposal measures, and they are so treated by all concerned.⁸

(2) The great uncertainty created all around by our foreign surplus disposal operations. We, ourselves, don't know how long we will place primary emphasis on this type of adjustment, what forms the programs will take, the extent of the price concessions and the nature of the side conditions attached to such sales. And foreign competitors are completely in the dark with respect to our plans, as are prospective recipient nations. In this context, rational action is impossible. Plans of economic development of several years' duration based upon agricultural exports from the United States must be based upon either hope or conjecture, consequently they often are not made. This is the irresponsible aspect of our foreign surplus disposal policy.

The question may then be asked—what do we need to do to make these disposal programs acceptable to friendly competing nations and to contribute to economic development in the recipient nations? I would state the basic need as follows: in the disposal of surplus agricultural commodities in foreign countries, the United States must be prepared to make some policy commitments of long-run duration with respect to program objectives, availability of supplies, means of financing and so on. The

⁸ This emergency view of foreign surplus disposal of the present Administration becomes abundantly clear in the recent testimony of Clarence L. Miller, Assistant Secretary of Agriculture, on the "Food for Peace" Bill, S. 1711. He states that "we do not believe that any greater rate of disposition would result under a five-year extension than can be attained under a one-year extension." But nowhere in his testimony does he give consideration to the needs and problems of the recipient countries in undertaking economic development. On the contrary he voices the fear that the authorization of supply commitments up to ten years would "... provide for programming of certain commodities whether or not they are in surplus supply." For Mr. Miller foreign surplus disposal is simply an avenue of disposing of visible surpluses that happen to be in the hands of the United States government.

specifics of this general course of action can be stated under the following seven points:

(1) Except in famine situations, surplus agricultural commodities in the United States, when disposed of abroad, are to be used *exclusively* to finance economic development. Economic development is here interpreted broadly to include education and training of the human agent as well as physical capital formation, but all food and fiber shipments must be related to, or integrated into a plan, or plans, of economic development.⁹

(2) Once "surplus" agricultural commodities from the United States become committed to a development plan, or project, of a foreign country, for whatever duration, one year or ten, they cease to be surplus commodities *and the whole operation ceases to be a foreign surplus disposal operation*. At this point, the committed supplies become "development supplies" and get built into the aggregate demand for the farm products of the United States; they become a recognized claimant on domestic production in the same sense as the School Lunch Program and the International Wheat Agreement.

(3) Food and fiber supplies committed to development plans and projects would be financed by means acceptable to the recipient countries but with the basic objective of speeding economic development: perhaps by grants, perhaps by loans, perhaps by sales for national currencies. The financing principle to be followed here is one that maximizes economic development, not the money return to the United States. The charge that the United States' only concern is that of exporting its farm problem would thus be refuted and the entire program would become a humanitarian program with lasting possibilities.

(4) Recipient countries must in every case provide evidence that these "development supplies" from the United States do not reduce their "normal" acquisitions of food and fiber from other countries. By this and the previous point, criticisms by foreign competitors would lose their force.

(5) Since "development food and fiber supplies" could finance only a part of every plan or project, complementary programs to finance the purchase of hard goods, construction materials, and services would be necessary. In some cases, food and fiber supplies might finance up to 70 or 80 per cent of a project (e.g., road building under an antiquated state of the arts), but in most cases the percentage would be lower. Hence, the financing of non-agricultural supplies must be a part of the total program.

(6) Competing nations burdened with agricultural surpluses (e.g., Canada, Argentina) should be invited to participate in this "food for de-

⁹ This statement is not intended to constitute a rejection of multi-lateral commodity agreements; such agreements must play an important role in a controlled agriculture.

velopment" program. And to the extent that competing nations desired to participate, multilateral arrangements could be initiated. This is the way that a formal international program under the sponsorship of the U.N. might come into being.

(7) But until such time as a world program did come into being the F.A.O. (or some other U.N. agency, or set of agencies) should be charged with the responsibility, and be provided with the necessary funds, to aid recipient countries formulate and execute plans of economic development. This provision would speed development where administrative experience and technical know-how are most lacking. Further, it would free the United States of the charge of meddling in other countries' internal affairs.

Now some of you must be saying—"What does this fellow mean by using food to finance economic development; I know what it means to give food away, but how do you use it to finance a 5-year plan, or education?" Since my whole argument rests upon the use of surplus food supplies to create capital, human and physical, in underdeveloped countries it is imperative that I show how this can be done. And let me do it through the use of two illustrations: (1) the simple case of road building or land clearing in a very poor country, and (2) underwriting a part of the costs of a major plan of development in a country such as India (because of time limitations we must forego the important but complex case of vocational education and training).

First let us consider the simple road-building or land-clearing case in a very poor country. The country involved would plan the project, probably with the technical assistance of F.A.O., and mobilize the workers involved, together with their families, into construction camps. The United States would commit itself to provide the kinds and quantities of basic food-stuffs and fiber products required to feed and clothe the workers and their families for the duration of the project. The United States would further grant the country a loan to permit it to acquire the hard goods required on the project—picks and shovels and some heavy equipment, but not the ultimate in modern earth-moving equipment. The food and clothing costs of the project would probably run to 60 to 70 per cent of the total project costs, and these costs we would defray. The foreign country involved would pay the workers a small cash wage in its own currency.

Now let us consider the use of food supplies in underwriting, in part, a national plan of economic development. Assume that India comes to us with a five-year plan, which she may well do, involving the transfer of thousands, possibly millions, of workers first from low-production jobs in agriculture into some kind of vocational training and second into manufacturing and construction jobs. In the early phases of the plan total output of food would probably decline somewhat; in later phases, the demand for food resulting from the increased productivity of the workers involved

would probably increase more rapidly than agricultural production. Thus, to execute such a plan without serious price inflation the country would need to increase its imports of food supplies for 5 or 10 years. But it is already using its scarce foreign exchange to import the hardware central to the execution of the five year plan. Here, then, is where we would step in and offer to provide those food supplies at such prices and under such loan conditions as would not impair the financial structure of that developing country. We would agree to supply a given bill of food and fiber goods on the condition that it did not cut back its normal commercial purchases from us and other national suppliers. This we are doing in sort of an after the fact way with India right now. But we should formalize the procedure and turn it into a forward operating instrument of policy in the case of India and other responsible national governments (e.g., Mexico and Turkey and perhaps Egypt and Pakistan).

There are shortcomings to the above general approach. First, it would cost more than the present program for comparable quantities. Second, many governments in underdeveloped countries are not sufficiently strong, or sufficiently responsible, to effectively administer the development plans and projects envisaged. Third, the substitution of development supplies for regular imports will not be stopped in every case, and the demonstration that development supplies are not being substituted for regular imports will never be completely satisfactory to all parties concerned. But to recognize that problems would be involved is not to say that we should not give these ideas a try. Any course of action, including doing nothing, involves problems.

Many economists criticize me for this stand, arguing as follows: This course of action will perpetuate the farm surplus problem in the United States, and it is an inefficient way to help the underdeveloped countries to help themselves. It would be better policy, they argue, to move toward freer trade, and make dollar grants, or loans, to these countries and thus permit them to purchase what they need for development purposes wherever in the world they are able to get the best deal. To this I would say they might be right if the economic maladjustments in the world were not so overwhelming. There is an approach that works well when economic sectors and resources are in reasonable adjustment—when we are concerned with inter-firm resource adjustments in an economic world that is functioning smoothly. But there are serious maladjustments abroad in the world—some countries are poverty stricken, others are struggling to keep from falling back into a poverty situation, and still other are cursed with a surplus of agricultural commodities. These kinds of major maladjustments the market does not handle well.

Under the course of action suggested here, two great social complexes, each unstable and unhappy by itself, are made to complement one

another. On the one hand we have massive poverty, underemployment, and a revolutionary drive on the part of the peoples involved to improve their worldly lot. On the other we have great opulence, excess agricultural capacity now taking the form of food and fiber surpluses, and a strange mixture of humanitarianism and fear. The transfer of surplus food and fiber supplies from the United States and their conversion into development supplies in underdeveloped countries becomes the policy bridge whereby the pressure of food and fiber supplies on population in the United States is moderated and the pressure of population on food and fiber supplies in the underdeveloped countries is moderated. By this policy bridge we buy the kind of adjustment time required in each social complex; and its construction would constitute political action at its best.

IV

It is one thing to moderate the pressure of food and fiber supplies on domestic population through the sustained use of excess agricultural productive capacity in the United States to finance development in underdeveloped countries, and it is quite another thing to keep that pressure from rebuilding. If we were to run a foreign development program on a sustained basis at the level of current surplus disposal operations, *and if the rate of aggregate farm output expansion did not increase*, this course of action would reduce by about one half the amount of contraction needed to bring total agricultural output in line with total demand at a level of farm prices slightly above present levels. If further we were to run a foreign development programs on a sustained basis at double the current level of surplus disposal operations, *and if the rate of aggregate farm output expansion did not increase*, this course of action would erase the surplus stock situation in a reasonable time and begin to exert an upward pressure on the level of farm prices. If, still further, we were to run a foreign development program on a sustained basis at triple the current level of surplus disposal operations (which is probably all that the non-Communist world could take on a need basis and a good deal more than it could take on an effective development basis) *and if the rate of aggregate farm output expansion did not increase*, this course of action would very quickly exert a strong upward pressure on farm prices.

But please note that to each of the above situations, which progress from the realistic to the idealistic, I attached the condition *if the rate of aggregate farm output expansion did not increase* with increases in total demand. But what is to keep the rate of aggregate farm output expansion from increasing in these situations? What is to keep the pressure of food and fiber supplies on domestic population from rebuilding? Nothing so far as I can see, unless farmers accept comprehensive supply control. The

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total outturn of food and fiber supplies in the United States is currently outracing total market demand (domestic and foreign) plus the current level of foreign surplus disposal. And the rate of output expansion would certainly increase under expanded foreign development programs.

For the doubters let me recall some history. In the late 1930's agriculture was plagued with excess capacity just as it is now. But as the demand for farm products strengthened in 1939-41 with the happy shift from widespread unemployment to full employment that excess capacity was used up, and both farm prices and farm output began to move up. And when the World's food needs were heaped upon this domestic full employment demand during and following World War II, and the total demand for food and fiber products shot forward, the total output of the United States agricultural plant also shot forward. Despite the huge outflow of human resources from agriculture during the war years, 1942-44, and the limited inflow of capital, aggregate output followed closely behind the great expansion in demand of that period. And aggregate output caught up with demand in 1948-49, and has been pressing against it ever since.

I would argue further that the output-increasing potential of American agriculture is greater today than it was in the late 1930's. First, the excess productive capacity that could be thrown into the breach of expanding demand is greater today than in the late 1930's. Second, total inputs in agricultural production could be easily and readily increased through a slowdown in the rapid rate of outmigration from agriculture. Third, there is no hot war at the present time to limit the inflow of capital, and farmers' asset positions are generally much stronger today than in the late 1930's. Finally, a broad front of new knowledge currently exists to be adopted in agriculture. In sum, it is my considered opinion that an expansion in total demand resulting from a tripling of present levels of surplus disposal would be matched by an increase in aggregate output within two or three years.

Thus I draw the following conclusions: (1) any expansion in aggregate demand from any source that might be contemplated now or in the foreseeable future will be quickly followed by an expansion in aggregate output such that the pressure of food and fiber supplies on population is reestablished, with the consequent depressing effects on prices and/or a buildup of surplus stocks; hence (2) the receipt of good and stable prices and incomes by farmers generally is dependent upon their widespread acceptance of supply control.

I have recently discussed the mechanics of supply control in some detail¹⁰ and I shall not repeat it here. But we must be clear on terms, and

¹⁰ "Some Further Reflections on Supply Control," *Journal of Farm Economics*, Nov., 1959.

we must share some common ground with respect to general methods, potentialities and problems of supply control. By supply control I mean the conscious adjustment of supply to demand, commodity by commodity, year after year, to yield prices in the market that have already been determined as fair by some responsible agency. And we recognize that numerous avenues of adjustment have been tried, or discussed, in connection with supply control, although most have been conceived as emergency measures and in a half-hearted spirit. But farmers have taken and continue to take some steps in this direction. There are, first, the voluntary efforts of cooperative marketing associations to control marketable supplies. There are, second, the efforts of government to control supplies through the control of one input—usually land, but occasionally the more daring ideas of a planned movement of labor out of agriculture, or a tax on the use of a key input (e.g., fertilizer), are considered. There is, third, the use of sales quotas to limit supplies to some market goal.

The first of these efforts has never proved effective except where linked to the third. The second general method has been employed many times in many forms with varying degrees of success. The third general method has been employed with considerable success in sugar, tobacco and certain specialty crops, but it has not as yet found acceptance among the major problem commodities—not in the great feed-livestock complex, including milk, or in wheat, or cotton.

It is my contention, however, that farmers must come to accept supply control of the rigorous type involving the use of sales quotas. This contention is based upon two strands of reasoning: (1) the general conclusion reached above to the effect that total supplies will quickly adjust upward to match any expansion in demand, and (2) that supply control based upon adjustments in any single input (e.g., land, or labor) is blunt and ineffective. Land retirement and the movement of labor out of agriculture are blunt processes which do not lend themselves to fine adjustments in supplies; only the roughest relation can be established between a planned reduction in the employment of land, or labor, and the output response—and this is not good enough where demand is highly inelastic. And, as the state of the arts advances, our ability to substitute one factor for another increases, hence we can expect the ready substitution of uncontrolled inputs for the controlled inputs under this type of control, and an ineffective supply adjustment. Trying to adjust supplies through the control of one input is like trying to bail out a leaking boat with a sieve; it is next to impossible.

In the world of effective and comprehensive supply control the composition of demand is all important, for remember what we are doing is adjusting supplies to demand-at-a-price. In thinking about this control

problem it is convenient to break total demand into four components: (1) domestic market demands, (2) special domestic program demands (e.g., school lunch), (3) foreign commercial demands and (4) special foreign program demands (e.g., to finance economic development). The first component is given to the problem by the level of employment and consumer tastes, the second contains precious little room for expansion, and the third, too, is given to the problem. It is with respect to the fourth component, the special foreign program demands, that real room for decision exists. Decisions made with respect to this fourth component will determine in large measure the size of the initial bite of supply controls on producers for several years to come—will determine the size of painful downward adjustments required of American agriculture. In this way domestic supply control and foreign surplus disposal are inter-related: the magnitude of the former in the initial stages, at least, depends upon the magnitude of the latter; the latter without the former is of limited value to American farmers; and in operation they fit hand in glove.

The task of this paper is completed; the marriage of foreign surplus disposal and comprehensive supply control has been recorded. The mechanics of this marriage union are sketched in the foregoing paragraphs relating the adjustment of supplies to demand; the logic of the union has been the work of the whole paper.

THE FIFTIETH YEAR—AMERICAN FARM ECONOMIC ASSOCIATION

Chairman: R. G. Bressler, University of California

THE FIRST FIFTY YEARS

O. B. JESNESS

University of Minnesota

WHAT is my assignment? Is it to demonstrate a living-in-the-past senility which some of you hot-blooded youngsters associate with anyone who has reached the biblical benchmark of three score and ten? Am I expected to extol the good old days and to deplore the evil days of modernism and the ways of the juveniles? The architects of the program charted no course for me. They knew it was futile, consequently provided no blue print. They left me a free agent so the responsibility is mine.

The translation of an all-wise but unnamed cab driver of the inscription on the Archives Building in Washington, "The Past is but Prologue," into "You ain't seen nothing yet," may invite us to dismiss what has gone before, but before doing so let us recall that the present would be as impossible without a past as it would be hopeless without a future. If perchance there should be someone here who is not concerned with the events of the past half century, he may have different ideas about the place to be accorded the next half century when the Association celebrates its centennial. Carl Sandburg may see the past as "a bucket of ashes" but to us the past of this Association and the achievements of our profession are the foundation on which to continue building for the future. Longfellow wisely said: "Look not mournfully into the Past. It comes not back again. Wisely improve the Present. It is thine. Go forth to meet the shadowy Future, without fear, and with a manly heart."

We are observing the golden anniversary of our Association, not of our profession. A professional organization such as ours comes into being only after pioneers have laid the groundwork and their numbers have increased to the point where the need for and gain from formal organization are clear. A detailed review of the history of Agricultural Economics or of the American Farm Economic Association would be impossible within the time limits set. Fortunately, we have available many details in that outstanding compilation, *"The Story of Agricultural Economics in the United States, 1840-1932"*, authored by Henry C. and Anne Dewees Taylor. If there remains an agricultural economist who does not have at least a browsing acquaintance with this gold mine of historical references relating to our field, he should waste no time in remedying that deficiency. Let

me also suggest that any agricultural economist who has not expressed his appreciation to Henry C. Taylor for the service rendered in undertaking and completing this monumental assignment by him and the late Mrs. Taylor, do so without delay.

The development of agricultural economics and of the American Farm Economic Association might be likened to that of a great river system such as the Mississippi. The head of this river gives no clue to the mighty stream it becomes before it reaches the Gulf. As it goes along it is joined by the Missouri, the Ohio and many other tributaries. One of the streams in the development of agricultural economics was work in farm management which had its inception in the growing interest of some men, trained for and engaged in technical production lines, in economic aspects and relationships of their activities. The other major stream originated with certain individuals with a background of training in general economics who became interested in applying its principles to agriculture.

The former group consisted of persons intimately acquainted with the operations and problems of the individual farm. Often they had little or no formal training in economics as such. They already were engaged in organized research in their technical fields as members of staffs of agricultural colleges and experiment stations. It was natural, hence, for such research in agricultural economics to develop first in farm management. The names of some of these pioneers are well known. In fact, many of us have had the distinct privilege of knowing some of them intimately, of receiving training under one or more of them, and of working with them. Prominent place on this roster belongs to George F. Warren, who did his work on this campus. His entry into the field was via horticulture, as he had come from Nebraska to Cornell for graduate study under Liberty Hyde Bailey. This relationship led Warren to an apple orchard survey involving economic aspects. The survey provided data for his Ph.D. thesis and started him on his work in farm management. Another of the wheel horses was my advisor, teacher, guide, colleague, and very close personal friend, Andrew Boss, whose research work in farm crops led him into farm management. William J. Spillman, whose background training was in mathematics, played an important role in developing work in farm management in the United States Department of Agriculture. Thomas F. Hunt, Fred W. Card and others did their part in carving out a place for work in farm management.

The other tributary, general economics, included among others two who are still living and who were among the first group to be elected "Fellows" of this Association in 1957, Henry C. Taylor and Thomas Nixon Carver. They with several others who could be cited in this connection played an important part in the development of agricultural economics. The work

developed by them and that in farm management gradually converged and amalgamated.

The seeds of the American Farm Economic Association were sown at meetings of other associations and conferences which brought together leaders with a community of interests. The parent organization in the broad field of economics, The American Economic Association founded in 1885, was one. An evening session of its program in 1892 was given over to a discussion of "The Farmers' Movement." Papers relating to agricultural questions appeared occasionally on its programs or as contributed articles in the *Review*. A roundtable discussion of agricultural economics was part of the program at the 1907 sessions.

The American Association of Agricultural Colleges and Experiment Stations provided a meeting place for workers, especially men with administrative responsibilities, in technical agriculture. One of the activities which grew out of this association was a graduate school of agriculture which held a total of seven sessions between 1902 and 1916, meeting at various agricultural colleges. While this school was primarily concerned with technical agriculture, specific provision for attention to agricultural economics was included in the 1908 session and again in 1910. This is pertinent to our review because in the closing days of the four-weeks session at Iowa State College in 1910, a group of those present organized the American Farm Management Association.

The fact that this new organization centered so largely in the specialized field of farm management rather than encompassing the broad field of agricultural economics became a matter of concern to H. C. Taylor. He argued strongly for the broader coverage, viewing farm management as part of agricultural economics.

It is interesting to note in this connection that H. C. Taylor served as chairman of a roundtable discussion on farm management at the 1912 meeting of the American Economic Association. None of those who participated in the organization of the American Farm Management Association appeared among the discussants, indicating the existing division between the two groups. Plans for establishing the National Association of Agricultural Economists were started in 1915 at a meeting of the National Conference of Marketing and Farm Credits and the organization was formed in 1916. A proposal to consolidate the two organizations was made in 1917 and this bore fruit in 1919.

The *Journal of Farm Economics* for September 1919 (Volume I, Number 2) included a report of a committee consisting of H. C. Taylor (Wisconsin), J. A. Foord (Massachusetts) and K. C. Livermore (New York), recommending that the name be changed from the American Farm Management Association to the American Farm Economic Association. This

change was adopted. An added note by H. C. Taylor indicated that a committee of the American (sic) Association of Agricultural Economists had recommended consolidation with the older and larger association by its members joining the American Farm Economic Association. This action was taken.¹

A proposal at the meeting when the change in name was approved to adopt the name the American Farm Economic and Farm Management Association was voted down. The principal changes made in the constitution were to replace the word "management" with "economic" or "economics," as the case required and to broaden the object by inserting after "farm management" the addition "and other economic questions pertaining to agriculture."

Those of you whose memberships date back to the 1920's may recall that evidences of rivalry and suspicion between some members of the two groups did not disappear all at once. Nominating committees found it expedient to keep in mind appropriate rotations in selecting slates for officers. This situation was not unaffected by the continuation of separate departments of farm management and agricultural economics at a number of agricultural colleges for a considerable period. The process of consolidation of departments took time, in some cases having to await resignations, retirements or deaths, particularly at administrative levels.

An anniversary always presents an invitation to take a look at where we have been and how far we have come. The exuberance of youth may not make much room for credit to the past. Young or old we are tempted to think that progress began with us and, as the years accumulate, there may be moments when we suspect that it may end with us as well. Certainly there were a lot of things which the economists back in 1910 did not know. Likewise there are a lot of things we do not know today. Surely we would be amiss if we let an occasion of this kind pass without giving due recognition to the pioneers for their service in laying a solid foundation for growth and development. Each of us might do well in moments of thankfulness to acknowledge our debt to our mothers and fathers who made us possible. In a similar vein we might include the pioneers for making so much of our work possible.

H. C. Taylor's *Introduction to the Study of Agricultural Economics* (1905); T. F. Hunt's *How to Choose a Farm* (1906); T. N. Carver's *Principles of Rural Economics* (1911); G. F. Warren's *Farm Management* (1913); G. H. Powell's *Cooperation in Agriculture* (1913); Andrew Boss' *Farm Management* (1914); and L. D. H. Weld's *Marketing of Farm Products*

¹ See H. C. and Anne Dewees Taylor, *The Story of Agricultural Economics*, pp. 86-98. Also see article by H. C. Taylor, "The Development of the American Farm Economic Association," in the *Journal of Farm Economics*, Vol. IV, No. 2, April 1922.

(1916) are illustrative of pioneering books which helped provide the groundwork for progress. Perhaps not all of you are fully aware of the debt you owe these men and their contemporaries.

The earlier research in agricultural economics was largely in farm management. This was a logical outgrowth of the entry into this field of men engaged in technical agricultural work in which formal, organized research already was in progress as a function of the agricultural experiment stations. For example, the work of Willet M. Hays and Andrew Boss at Minnesota in crop research developed a natural interest on their part in costs and returns. They had to give up their first idea of getting cost results from experimental plots. However, this, instead of discouraging them, led to the idea of getting data from actual farm operations by arrangements with cooperating farmers. Studies in this field have continued at the Minnesota station for nearly sixty years. Early participation by the United States Department of Agriculture aided in the expansion of farm management research in Washington and encouraged other states to enter this field. The survey method of assembling data received its impetus from work here at Cornell under the leadership of Dr. Warren. Growing interest in marketing, prices, credit, land, and other economic problems soon led to expansion of research in these lines, either by adding such work to that in farm management or by the establishment of separate departments of agricultural economics.

Anyone interested in tracing the broadening and deepening of work in agricultural economics over the years will find a review of the contents of the *Journal of Farm Economics* over the last four decades of help. Number 1, Volume I of the *Journal* consisted of only 40 pages, in contrast with the more than 300 pages for the May, 1959, issue. The price of a single issue in 1919 was 35 cents (raised to 50 cents the next year). That the Association's treasury was not without problems is indicated by a note in the October, 1920, issue which called attention to the need for limiting that issue to 24 pages because one-third, or about 170, of the members had not paid their annual dues for that year.

Articles relating to farm management dominated the early issues of the *Journal* but as workers with interests in other fields became affiliated with the Association the subject matter broadened. The concern of farmers with the rapid decline in farm prices from World War I peaks showed up in an article by H. C. Taylor in the January, 1921, issue, "The Adjustment of the Farm Business to Declining Price Levels." The author concluded that:

The problems of farm organization, land tenure, farm finance, marketing, country life, and a national agricultural policy, demand the attention of the keenest minds and the best judgment the world can afford. It is the duty of

the men of the American Farm Economic Association to take the lead in the solution of these problems. If we sit calmly by studying the phenomena in a cold scientific way and fail to aid those who are demanding action, we will deserve to be called sterile. It is only as the results of scientific work make themselves felt in a better life that science is justified. The closest relations should exist at this time between the workers in the field of farm economics and the leaders of organized agriculture.

The fact that Dr. Taylor had moved from Wisconsin to Washington, D.C. to serve as chief of the Office of Farm Management and Farm Economics in the U. S. Department of Agriculture added emphasis to this expression. His words on that occasion merit attention today.

Agricultural economists of the present may like to regard themselves as much more "sophisticated" than their predecessors of forty or fifty years ago. They might suggest a comparison of the contents of recent issues of the *Journal* with those of earlier numbers in support of such a claim. It would be unfortunate for the profession if such a comparison did not evidence growth and development. One did not need to be a high-powered mathematician to comprehend the materials in the early issues. Economic models were not paraded. Contributors had never heard of macro- or micro-economics. Linear programming was not in the picture. Ideas with respect to monopolistic or imperfect competition had not yet taken formal shape.

One way to look at the economists of that earlier day may be with a feeling of pity over the paucity of their equipment and the limits of their knowledge. However, before you allow your feelings to get too expansive on this score it may be in order to take note of the solid achievements of the pioneers in spite of these handicaps. Are you satisfied that accomplishments today are fully commensurate with the improved tools, mechanics and understanding?

How sure are we that there is not some truth in the charge that at times we become so absorbed in tools and mechanics that we lose sight of the real objectives? There was a period in which the survey method of assembling data seemed to be more important than the data themselves. For a time, correlation analysis was a *sine qua non*. It took time for some to realize that coefficients by themselves established no relationships but merely gave some indication of the extent of the relationship after its existence had been arrived at by reasoning and logic.

Economists, except perhaps those who had succeeded in cloistering themselves in their ivory towers, knew long before the ideas of monopolistic and imperfect competition were formalized that absolutely pure, perfect or free competition was to be found only on the pages of texts and in the claims of some spokesmen for business. It was the latter, not the

economists who thundered about the inexorable law of supply and demand.

However, the new gospel was so refreshing to some economists that they took it literally and assumed that the beautiful curves of the new theology illustrated actual behavior patterns, not merely tendencies. The fact that different managements faced with the same set of circumstances and conditions behaved differently did not seem to bother them. Could it have been because they did not concern themselves with the patterns displayed in the real world?

We are now approaching a situation where the economist has to be a full-fledged mathematician, or at least make the pretense of being one. Here again may we not be falling into the error of confusing form with substance? This is not to say that there is no place for mathematics, rightly used, in the kit of tools of the economist. That place is as a tool of analysis and expression, not as the end sought. There is some danger that we may become so preoccupied with manipulating the equipment that we fail to put it to productive use.

The adjective "agricultural" before the title "economist" should indicate the field of specialization and not suggest doubt over the qualification of the individual as an economist. A well-rounded training in basic economics is essential. However, to merit recognition in his field of specialization, the individual needs to have specialized knowledge and understanding of agriculture as well. While technical training in agriculture and first-hand farm experience may not be an absolute requirement for all in the field, they are very helpful. Agricultural economists have a distinct advantage over some of their colleagues in certain other lines of specialization in that they have the opportunity of working with live data and actual problems. This point does not seem to be grasped as universally as it was in earlier days. Some graduate students become so enamored with theory that instead of using it as a guide and tool in analyzing real-life data they content themselves with trying to theorize about what the data should show rather than trying to find out what they really do show.

There is a ditty familiar to many of you, illustrating the advantage of farm upbringing in grasping some of the facts of life. It runs

"City boys and girls have to read a book.

Farm boys and girls go to the barn and have a look."

It is commonly accepted that farm management workers who deal with problems related to the operations of the individual farm business need first-hand acquaintance with those operations. But how can a person do really effective work in marketing problems, methods and structures unless he has done some real looking in the market place and conferring

with market personnel? Even in such a field as prices, which may appear somewhat detached, ideas and impressions gained from first-hand observations can be very helpful guides and modifiers.

The field of agricultural policy is one for the attention of the "generalist" who has had broad contacts and has been seasoned by experience. Desktop diagnoses of farm policy problems and prescriptions based thereon are not a very effective substitute for a thorough examination of the patient, guided by knowledge, understanding and ability to see, hear, interpret and reason. In short, agricultural economists need ever to be ready to "go and take a look," not to rely only on the book.

Leonard Silk of *Business Week*, in an article on business forecasting in *Looking Ahead* (National Planning Association), April 1959, made an observation which fits in well here. It was:

We may labor long and hard on our sampling variances, our leading indicators, our linear systems, and predetermined variables, and asymptotic covariance matrices, but people will still louse us up. Uncertainty is our destiny. However, as the old saying goes, a man should live if only to satisfy his curiosity.

Perhaps one more comparison between the "old" and "new" may be permissible. It is a safe guess that Number 1, Volume I of the *Journal of Farm Economics* was read from cover to cover by a decidedly larger proportion of the membership than would be true for Number 2, Volume XLI. The fact that the latter had over eight times as many pages would be one factor but not the only one. Another is the multiplication of lines of special interest. The first issue dealt with farm management for a membership heavily weighted with workers in that field. The *Journal* now has to appeal to a much broader interest. But this is not all. Important place must be given to differences in readability. The point is not that the contributors of articles during the earlier period had superior command of English. In fact, the more limited vocabularies of the day made for easier reading. But there is reason to believe that the writers of that day had not become infected with the virus so prevalent in scientific writing today, of using words to display erudition rather than to convey ideas. At times, this may reflect confusion in the writer's mind as well as creating confusion in the mind of the reader.

Why should not agricultural economists apply a good marketing practice in their writing? Package ideas so that they will appeal to readers. Mention was made earlier of the point that economists today may think of themselves as being more sophisticated than the earlier generation. One of the definitions of this term hits the bull's-eye. That definition is "lack of simplicity." Applying this definition may we not have to confess, not boast, that an undue share of our writings may be too "sophisticated"?

The plea is not for a pretense that the complex is simple but for resistance against the temptation to make the simple appear complex.

Thanks to those who builded so well, the American Farm Economic Association has made outstanding contributions to the advancement of knowledge and understanding. But anyone who is content to bask in the reflected glory of his ancestors accomplishes little in this world. As the homely saying goes, he resembles the lowly potato—the best part of him is underground. You are not going to fall into that error. The record of this Association for the second half of its first century will be written by you and by those whom you are training to take over when you are gone.

Agriculture will continue to have need for services which members of our profession can render. The opportunity to provide inspirational leadership in an attack on and solution of economic problems is yours. The crop of progress of tomorrow will depend on how well you till the field of opportunity today. Let us not spend so much time talking to and arguing with one another that we fail to establish contact with the real world and its people. Without first-hand contact with the problems of that world and communication with its people, our efforts will be of limited effectiveness. This includes improving our understanding of the work and problems of colleagues in technical production lines and communication with them. The supply of problems in agricultural economics is mounting, not melting away. You will not fail to meet the challenge which lies before you.

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THE CURRENT STATE OF AGRICULTURAL ECONOMICS: METHODS AND POTENTIALS IN AGRICULTURAL ECONOMICS RESEARCH¹

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I. Introduction

AS THE American Farm Economic Association is now entering its fiftieth year, it would be logical for us to compare the current state of agricultural economics research with that of a half-century ago. Alternatively, we could compare the current state of research in agricultural economics with the current state of research in other branches of economics. Or, we could compare the actual level of research practice in agricultural economics today with the level that is possible with the best use of available theory and techniques.

Time does not permit a real development of any of these themes. Instead, I shall deal very sketchily with a number of problem areas in agricultural economics research, commenting on the potentials of current analytical techniques in each area.

Various outlines could be used for classifying the problems of agricultural economics research. At the risk of overworking one word, I propose to speak of all of them as problems of efficiency—efficiency of firms, efficiency of consumers, efficiency of industries, and efficiency of regional or national economies.

Efficiency of firms: Agricultural economists have made outstanding contributions to research on the efficiency of firms. Work on production functions or response surfaces goes back a number of decades. Budgeting techniques were also well developed early in the history of the Association. During the last ten years, agricultural economists have made many applications of linear programming to problems of the farm business, carrying the budgeting approach to its logical conclusion. The same programming techniques are being applied by agricultural economists to problems of marketing firms, including the efficient performance of particular functions such as mixing feeds as well as the efficient operation of an entire plant or firm.

Efficiency of consumers: The modern theory of consumer demand is at least as old as the American Farm Economic Association. Freely translated, it suggests that a multidimensional indifference surface exists in the mind of each consumer. If perfect competition exists throughout the

¹ Journal Paper No. J-3728 of the Iowa Agricultural and Home Economics Experiment Station, Ames, Iowa. Project No. 1354.

economy, the entire pattern of production and resource use (apart from defense production) will be tugged into an optimum alignment with the existing consumer indifference surfaces. The consumer is sovereign, and the economy adjusts itself to his wishes. By assumption, he gets what he wants and wants what he gets.

The sovereignty of the consumer meets with varying degrees of respect in our applied research. Much research in consumption economics assumes (as I do) that the consumer *really* wants the contents of the food package rather than the composite commodity "contents plus package plus intangible values (if any) created by advertising." Economists who indulge in this type of research argue that they are not tampering with consumer sovereignty but are simply defending it against the hucksters.

Other approaches to efficiency in consumption are less respectful of consumer sovereignty. For example, if we assume that what the consumer wants from food is a certain array of calories, grams of protein, and other nutrients, we can, by linear programming methods, arrive at a "least-cost diet" which will minimize the cost of food and maximize the cost of surplus disposal. A less rigorous application of this approach leads to a "low-cost adequate diet" that would entail a twenty percent decrease in our total retail expenditures for food!

In sharp contrast to this austerity or efficiency approach is research on methods of increasing demand. The latter emphasis suggests that the consumer is not an end but a means. However, when confronted with promotional efforts designed to persuade him to eat more, the consumer acts as though he is hard of hearing. And if he really does hear, he may well inquire of the promoter, "Do you want me to eat more for my sake or for your sake?"

Efficiency of industries: Given perfect competition in all sectors of the economy, there would (according to economic theory) be no need to concern ourselves about attempting to increase the efficiency of an industry. But imperfect competition exists in some of the industries marketing farm products and selling production goods to farmers. Hence, measurement of the degree of competition in an industry, and its effects on farmers, becomes of interest.

Models for measuring market imperfections on an industry-wide basis are inherently complex. However, several agricultural economists are experimenting with spatial equilibrium models which may throw light on the extent of certain types of market imperfections and industry inefficiencies. Other important problems of industry efficiency can hardly be dealt with without access to the books and even the engineering data of some or all of the individual firms in it. Many of the nuances of imperfect competition cannot be seen from the grandstand and may even go undetected by umpires such as the Federal Trade Commission.

Efficiency of regional and national economies: In the late 1920's, the farm income problem was seen as secular rather than cyclical. In the 1930's, unemployment and the business cycle were recognized as the primary causes of farm distress. For at least a decade, these cyclical factors continued to be of primary concern to agricultural economists.

Within the last ten or twelve years, agricultural economists have come to recognize that secular imbalance is again the major problem. The recent rapid decline in numbers of farms and the extensive interpenetration of rural and urban patterns of living have been forcing agricultural economists to study the secular interrelations between agriculture and the rest of the economy. These interrelations have been recognized to some extent for many years but the degree of emphasis upon them is rapidly increasing. Furthermore, analogies are being recognized between the development problems of foreign countries and the development problems of rural areas in the United States.

II. Available Methods and Research Potentials

Concerning the level of adequacy of our methods of analyzing problems of the *firm*, I would say that we are rapidly "surrounding" at least those types of firms that produce a limited range of products and that have stable production functions. In programming solutions for farms, we confront sizable random or stochastic elements arising from the effects of weather; also, if the land in a farm is at all heterogeneous, production functions for the farm as a whole may neglect some of the subtleties that are recognized at least intuitively by the farm operator. Presumably, these subtleties *could* be quantified and included in a more detailed programming solution recognizing different qualities of land within the farm.

The multi-product firm and the multi-plant firm still offer a great many difficulties in practical measurement. However, considerable progress is being made in the study of firms as complex as supermarkets and in relating their management decisions to quantitative models of the communities within which they operate and the competition they face.

Linear programming techniques also lend themselves to the normative analysis of certain aspects of *consumer* behavior. For example, if we assume that the consumer wants to pay the lowest possible price for any given commodity, we can, in a given store in a given week, say which brand he should buy. We could extend this same normative approach to groups of commodities, and work out a "least-cost market basket" under as extensive a set of restrictions or side conditions as we might wish to make.

About three years ago, Fred Waugh published his article on the statistical derivation of community indifference surfaces. It seems to me that a bridge could be established between the theory of consumer demand and

the practical operation of a supermarket if a sufficiently detailed record were maintained of sales of particular commodity groups by a supermarket with a fairly stable marketing area and clientele. In effect, the array of prices and quantities (or price and quantity *indexes*) representing the supermarket's sales experience from period to period would give us a "plaster cast" of the community indifference surface of its patrons. This may seem far-fetched, but I think it is within our present powers to conceptualize and measure.

Methods are available which should enable us to quantify the geographical aspects of the price, interregional trade, demand, and supply characteristics of an *industry*. The spatial equilibrium model should be capable of development in considerable detail in terms of numbers of regions and numbers of interrelated commodities.

I am less able to judge our ability to deal with problems of imperfect competition. Nevertheless, so-called "simulation" techniques are beginning to be used upon economic data. For example, management "games" are being played on electronic computers as a training device for junior executives and for students of business management. Here "simulation" involves the selection of two or more management teams who go through conference huddles to determine their business strategies for the next accounting period as soon as the financial results of their last period's operations are known. The success of each firm's strategy depends on the economic characteristics of the industry, which are programmed into the computer. These characteristics are learned by trial and error on the part of the management teams, much as they would have to learn the nature of an industry in actual business life.

It seems to me that a large number of hypothetical models incorporating published characteristics of at least the larger firms in an industry along with such knowledge as we have concerning their market demand functions and production functions could be tested out. By successive approximations, we might be able to arrive at sets of functional relations and policy rules which would roughly correspond with the observed behavior of specific industries. If so, we might then proceed to test out certain alternative policies for the preservation of competition (if this is considered to be a problem) and to explore alternative ways of "simulating" competitive price behavior and resource allocation through some form of public regulation.

Tools available for analyzing complete area or national economies are becoming increasingly available and trustworthy. The interindustry relations model is available for describing the cross-section structure of any complete economy. However, it is perhaps most useful in describing a relatively self-contained economy, such as that of the United States as a

whole. The models that have been derived for states or regions so far have understated the extent of inter-area commodity flows by including estimates of *net* inter-area trade rather than of the actual gross quantities shipped into and out of the area. This can and should be remedied in future applications.

The potentialities of the interindustry relations model for comparing different economies or for understanding a given one might be illustrated by the following intellectual experiment: (1) Construct a matrix of perhaps 500 rows and columns, reflecting the most detailed classification of economic activities permitted by the Standard Industrial Classification code, and including all of the different economic activities that take place in the United States as a whole; (2) construct a matrix at the same level of industry detail (a) for a region of several states, (b) for an individual state, (c) for a metropolitan area, (d) for a town of 25,000 population, and (e) for a village of 500 people.

The array of consumer goods and services purchased by the household sector of a small village in a prosperous farming area would be almost as complex as that purchased by the household sector of a large city. However, over ninety-five percent of the total "value added" represented by the consumption expenditures of village residents would be produced outside of the village. Also, a very large proportion of the goods and services produced by residents of the village would be "exported." Within the manufacturing sector, which is replete with interindustry commodity flows for the United States as a whole, the interindustry matrix for the village would be almost a complete blank.

Given a fairly crude interindustry matrix describing the economy of a given area, it should be possible to work out rather quickly some of the implications of the location of new economic activities in the area or of the exodus of existing economic activities from the area. A rough set of "national income accounts" could also be constructed for any given area, however small, and concepts that have been applied for the most part only to national economies could be adapted to them. For example, the consumption multiplier appropriate for analyzing the effects of local industrial development upon the economy of a small area would be based upon the propensity of residents of the area to consume goods and services *produced in the area*. Although this multiplier might be around 2.0 for the United States as a whole, it might be not more than 1.5 for a city of 50,000 and not more than 1.2 for a town of 5,000.

In brief, models exist and pilot empirical studies have been made which suggest that we have the ability to analyze problems of area economic development and problems of national economic stability and growth at almost any level of detail which appears relevant.

III. Research Potentials and Research Performance

Obviously, most of our actual research falls considerably short of our capabilities. The gap may not be wide in dealing with problems of the individual farm. It would be interesting to compare the recommendations of a good Extension farm management specialist using the budgeting approach with those derived from linear programming analyses based on the same information. Is the net profit obtainable via the linear programming solution one percent, five percent or ten percent higher than that arrived at through the budgeting approach?

One might ask the same question concerning the contribution of transportation models, spatial equilibrium models, and other operations research models—does the exact mathematical solution reduce the total freight bill on a commodity by one percent, two percent or ten percent relative to the level now being attained by traffic managers using less elaborate methods? In a word, do linear programming and other mathematical models represent a major breakthrough to substantially higher levels of efficiency, or are they simply “perfecting amendments” whose marginal benefits only slightly exceed their marginal costs?

Of course, even if the linear programming solution of the optimum production pattern for a given farm were only five percent more profitable than a typical budget solution, there could be economies of time and of managerial skill. Perhaps the electronic computer, properly programmed and fed with suitable data, *could* widely extend the highest type of farm management advice much as artificial insemination has extended the genetic influence of the best dairy bulls.

It would also be interesting to compare the performance of representative consumers with certain normative patterns of consumption efficiency that might be worked out by programming techniques. Would a “least-cost food shopping pattern” for a given community in a given week reduce the expenditures of the shrewdest shoppers in the community by one percent or by five or ten percent? How far away from the mark is the “average consumer”? Are there possibilities of increasing consumption efficiency by publicizing “least-cost shopping patterns” through various mass media and by incorporating such concepts into courses in home economics and economic principles?

Similar comparisons might be made between the concepts of an area economy, or of the national economy, carried in mind by the best “policy economists” and the most exact formal models that could be devised and used. Are some of our best economic advisers right for the right reasons? Or are their intuitions and rules of thumb vulnerable to unrecognized structural changes in the economy? Only if we actually constructed a “best” model of the United States could we evaluate the differences be-

tween policy measures resulting from its use and policy measures recommended on less formal bases. Tinbergen and other economists in the Netherlands appear to feel that the formal methods are definitely superior and are well worth developing and using for policy purposes.

As in the other problem areas cited, explicit quantitative models of national or area economies would have the advantage of reproducibility. Over a period of ten or twenty years, it should be possible to demonstrate to large numbers of economists that certain "good" models behave consistently with known facts concerning the operation of the economy. It should also be possible to base educational efforts upon these "good" models which would carry public discussions of economic policy to a more sophisticated and farsighted level. With the aid of the then-new tools of Keynesian economics and the national income accounts, groups such as the Committee for Economic Development did a great deal during the 1940's to raise the level of policy formation with respect to national economic stability. Perhaps more complete models will permit similar educational accomplishments on problems of community, regional and national economic development, agricultural adjustment, and other public policy issues.

THE CURRENT STATE OF AGRICULTURAL ECONOMICS: THE POLICY CONTROVERSY

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I

THE fiftieth year of AFEA finds farm price and income policy in several ways a more controversial question than at any time in the past. Today's farm problems persist in spite of a prosperous general economy and recurring inflationary tendencies. An amazingly strong and sustained advance in the productivity of American agriculture, coupled with support of agricultural prices, has led to rapid accumulation of stocks under government control. The flimsy acreage controls inherited from the 1930's have altered the composition but not the volume of total farm output. P. L. 480 has increased export disposal of surpluses but not enough to prevent further accumulation, and a much-curtailed soil bank program is having only minor effects on crop production. Agriculture is going through the throes of large adjustments of its labor force and size of farm, and vertical integration is rearranging managerial and financial patterns. Poverty on small and unproductive farms remains a leading but neglected problem.

Meanwhile, a stalemate exists among the rival political and farm groups immediately involved in making farm policy. Acceptable new ideas are desperately sought but not forthcoming; and yet farm programs cannot continue as they are. The six billion dollar federal budget for agriculture, a staggering stock-pile of food and feed grains, and the bitter half-truths of *Life* magazine editorials are symbols of the present state of farm policy.

II

A quick scanning of the activities of agricultural economists shows them engaged in several kinds of work bearing on farm policy. Many of our profession are engaged in farm management, marketing, price analysis or other specialized research designed to discover economic relationships which turn out to be essential to decision-making in policy even though policy purposes may not be the principal motivation for the research. Others are engaged in collection of data and in preparation of economic indicators about agriculture that are absolutely indispensable to any discussion of policy. Agricultural economists are also concerning themselves with broader questions: they are trying to understand more fully how

*I wish to acknowledge the helpful criticisms of Herman Southworth and Elmer Learn without implicating them in the final result.

the total agricultural economy works and how it fits into the general economy; they are trying to identify the key elements in our present farm problems; a few are attempting to trace through the consequences of particular programs; and some are making firm recommendations as to what farm policies should be adopted.

Agricultural economists are also engaged in extension work in public affairs and in economic subjects that bear directly on policy. Many are teaching economics to college students who will have an interest in policy in the future. A few hold high positions as economic advisors in the government; others are consulted in unofficial capacities by the Administration and members of the Congress. Some are employed in administering farm programs, and a number working in the Land Grant colleges give considerable technical assistance to the operation of marketing orders and agreements. Farm organizations, large cooperatives, trade associations, and similar private groups often employ agricultural economists and frequently consult others not in their employ but in whom they have confidence. Even political parties at times find use for economists' counsel on farm policy.

Clearly, agricultural economists are in touch at many points and in many ways with the farm price and income problems around which so much controversy has raged in recent years. The profession has not ignored these issues, and it has not tried to keep them at arm's length.

III

What is agricultural economics contributing, and how does this measure up against what it might contribute? Probably the greatest, most enduring contribution to solution of policy problems is often unrecognized or taken for granted. I can suggest it by asserting that at least as much is known about economic relationships governing farm and industry behavior in agriculture as is known in any other large sector of the economy, and at least as good a set of measures of the changing economic situation is at hand for agriculture as is available for any other industry. Though farm policy is anything but a tidy, rational affair now, consider what a welter of confusion it would be if personal impressions were the only source of information on economies of scale in farm and marketing firms, the principles governing selection of farm enterprises, the make-up and behavior of marketing margins for foods, changes in farm production and prices over time, and a long list of similar facts and relationships that are explicitly or implicitly used in policy discussions every day. The body of such basic knowledge is far from satisfactory for policy purposes, but this does not deny the importance of the massive work already done.

The questions become sharper when we inquire what agricultural

economists have done to clarify the nature of economic problems confronting agriculture, to analyze and explain the consequences of alternatives for dealing with them, and to give intellectual leadership to developing effective policies for American agriculture. Clearly, some excellent work has been done. Only as examples, I suggest (a) on the conceptualization of agriculture's relation to the total economy, Schultz's work on the impact of economic growth and development upon agriculture; (b) on prospective market conditions for agriculture, the long-range projections made in the U. S. Department of Agriculture and by Black and Bonnen; (c) on analysis of policy alternatives, the recent research on domestic demand expansion by a group at Minnesota; (d) on coordination of broad policy research and education, the work of the Center for Agricultural Adjustment at Iowa; and (e) on the understanding of conflicts arising out of value systems, the ruminations of John Brewster. Incomplete as these examples are, they demonstrate that agricultural economists have attacked challenging problems of both theoretical and practical character and have obtained results useful for policy purposes.

IV

Before turning to the shortcomings of agricultural economists' work, however, we need to remind ourselves that the farm policy controversy—or controversy about labor, anti-trust, or tariff policy, for that matter—is a struggle among groups with conflicting economic interests and strongly held values concerning social organization and their own place in it. Conceptions of where economic advantage lies, and even in some degree value judgments, are based upon beliefs as to how the economy works. These are heterogeneous mixtures of valid conceptions, distorted understandings of economic principles that have been reduced to slogans, and old wives' tales. When conflict is joined on a particular issue, the participants usually enter it with their minds already made up. Out of a succession of conflicts there may develop, as has certainly happened in agriculture, a mutual forcing of the contending groups to extreme positions and a hardening of over-all policy approaches that virtually precludes fresh appraisal of an evolving situation.

The central function of economists in the policy-making process is to show what the economic aspects of the total policy problem are, to assist in developing alternative means for dealing with the problem, and to estimate the probable results of proposed lines of action. Neither the economist nor the noneconomist should be under any illusions that the economist is or ought to be the policy maker. But those who do make policy must do their share, and it is the major one, to maintain an environment in which economic analysis can perform its proper function. Even

work of genius—and our profession is short of geniuses—could make little immediate impact on the frozen policy positions and related beliefs now immobilizing farm policy. Persons holding strong views on how the economic world ought to work must recognize that the economist “with his feet on the ground” may well be one whose evidence indicates a different economic structure. If Congress seriously wants objective and competent analyses of economic questions involved in policy issues, the Senate and House Agricultural Committees must go far beyond listening to self-serving arguments put forward by witnesses representing interest groups at hearings. Agricultural economists disagree, of course, and for this they must accept some blame; but they disagree far less than active participants in the current policy controversy. A serious effort to incorporate into rival approaches to farm policy those points on which agricultural economists generally are in accord would substantially narrow the range of the present disagreement.

Especially since economic analysis has so much difficulty in making itself felt when and where policy decisions are actually being made, increasing the economic literacy of farm people and the general public is an important way by which agricultural economists can contribute to more effective policy-making in the long run. Extension programs have included many kinds of economic information for a long time. But focusing directly upon public affairs is still new in most states, and only a half-dozen or so have vigorous extension programs in this subject. Attention needs to be given to reaching farm people through other means of communication, such as farm magazines and the daily press, and in view of the popular misconceptions about farming, which agricultural economists have done little to prevent, it is important to convey a reasonably accurate impression of major farm problems to the general public.

V

In the short time remaining, I want to advance three basic reasons why agricultural economists have done less than they might to perform their policy function well. Two depend on a somewhat personal view of the role of science in answering policy questions, and the third involves allocation of agricultural economists' research efforts.

The first point is that we agricultural economists have been much less scientists than we usually claim to be. A science employs the interplay of theory and observation to build a body of verifiable knowledge. It does not hesitate to reconstruct fundamental concepts if and when some form of observation requires it. Desires regarding a preferred state of the world do not guide efforts to understand the world. But in economics we lean heavily upon old and honored models that omit or misrepresent much of

the structure of our present economy, and we do not consistently distinguish between their analytical and normative content. Attacks on tradition are often viewed as heresy—though it must be admitted that some of the attackers have given more attention to appearing heretical than to being persuasive. Our use of inherited models has in many subtle but powerful ways kept us from viewing the economic world as it actually is, has limited the range of our imaginations, and has encouraged a jumbling together of economic analysis and value judgments. We have learned less than we could in the areas where our methodology is effective. Policy statements emanating from agricultural economists often would be more modest, more in agreement, and more convincing if they were more scientifically conceived.

The second point is that agricultural economists have not been very productive in trying to understand the values of people involved in problem situations and in developing proposals that seem capable of bringing about an improvement. This is an area where a strictly scientific approach is of little help; indeed, it conditions many economists to avoid such questions entirely. But the questions are at the very heart of policy-making, and agricultural economists should be among the persons best qualified to consider them. There is no conflict with the desire to be objective as long as the goals of the proposal, the assumptions, and the supporting analysis are fully set forth. But this has seldom been well done. Many of the proposals agricultural economists have made (and free-market proposals are surely included here) have been based on personal values and assumptions treated as though they were economic facts.

The third point is that agricultural economists have not done enough research on the means of carrying out alternative approaches to farm policy or on probable results of particular programs. Much research in such areas as price analysis, farm management, and marketing has important application to policy, and this is one justification for doing the work. But policy research itself deals principally with applying knowledge of facts and relationships, drawn from all of economics, to the study of ways of dealing with problems involving group decisions and interests. Policy research as thus defined currently accounts for only a very small part of agricultural economists' research efforts.

VI

Much more might be said and perhaps should be said to explain and justify the comments made here, but the time has run out. I do want to add that the difficulties and shortcomings of agricultural economics in dealing with farm policy are no greater than those of other branches of economics in dealing with other policy. Indeed, the fact that agricultural

economics is an applied field has made its practitioners in some ways better qualified and equipped to analyze the diverse elements involved in economic policy.

The character of policy issues, the nature of economics, and the limitations of human beings guarantee that agricultural economists will disagree as long as the profession includes intelligent and forceful men who are concerned about policy problems. We may hope, however, that a better understanding of facts and relationships governing economic behavior in agriculture will emerge from future research in farm economics and that more perceptive and conclusive analyses of policy proposals will be built on this base. We can hope, too, that agricultural economists will display imagination and ingenuity in suggesting new policy and will be clear with themselves and with the public concerning the analytical and value-judgment elements of their proposals.

THE LOCATION OF ECONOMIC ACTIVITY

Chairman: D. Gale Johnson, University of Chicago

ON DESCRIBING THE STRUCTURE AND DEVELOPMENT OF A HUMAN POPULATION SYSTEM

RUTLEDGE VINING*
University of Virginia

SO THAT there may be a familiar focus for my discussion, I shall present what I have to say in the form of a review and consideration of certain concepts and figures of speech presented in a couple of chapters of a book by one of our more distinguished colleagues, T. W. Schultz. The chapters are under the headings, "Divergencies in Economic Development Related to Location" and "Income Disparity among Communities and Economic Development," and are included in Mr. Schultz's *The Economic Organization of Agriculture*.¹

Many of you will have read these chapters, and you may recall that in them Mr. Schultz is discussing what appear to him to be exceptionally large differences between the respective average family incomes of the populations of different countries and especially of the populations of different areas within the same country. He directs his attention particularly to the differences in this respect that may be observed between areas within the United States. The differences which he observes appear to him to be quite extreme, and he sees them as having not only persisted over the course of time but to have actually gotten larger with the passage of time. The populations within vast areas seem to him to have participated virtually none at all in the improvement of "levels of living" of which this nation boasts. Along with the more or less rapid enhancement of the average "level of living" for the nation as a whole, Mr. Schultz notes increasing disparities among the average incomes of families in different large areas of the nation. And he is led by his deliberations upon the matter to believe that there is a systematic tendency for these differences to become greater as a result of the very process by which the aggregate income and wealth of the population has been increased. He undertakes to explain why this supposed tendency is a characteristic performance property of a "system" such as that which now prevails; and regarding it as an undesirable property—an "imperfection," as he says—he considers various ways of altering the "system" for the removal of the "imperfection."

* The Institute for Research in the Social Sciences at the University of Virginia made this study possible through financial and secretarial assistance.

¹ The argument of these chapters was also presented in "Reflections on Poverty within Agriculture," *J.P.E.*, Feb., 1950.

While Mr. Schultz's argument, as always, is keenly relevant for discussions of public policy upon a persisting issue, these chapters are not, in my opinion, among his more lucid pieces of exposition. And the lack of clarity seems to me to stem from the ambiguity of certain concepts and terms which he employs. I shall try to clarify what appears to me to be an especially important concept, namely, the concrete object the growth and development of which Mr. Schultz undertakes to describe and evaluate.

1. Consider the statement with which Mr. Schultz introduces his discussion:²

A developing economy draws sustenance from various sources and in the process new branches appear, some old ones grow bigger, others stand about as they were, while still others wither away.

He speaks of the "process of development" having "occurred unevenly," of "development occurring in a specific locational matrix," of "locational matrices," "urban in composition," as "centers in which development occurs," of the "economic organization" working "best at or near the center of a particular matrix of development," and of its working less well "in those parts situated at the periphery of such a matrix."

Let us reflect upon the nature of the entity or thing or object to which the above statements and terms refer. It is something that "develops" and "grows"; in its growth and development "new branches appear" upon it, some of the "old branches grow bigger," others remain more or less unaltered, while others "wither away"; there are places upon it called "locational matrices" at which growth and development are particularly lively. What is this object, this thing with branches, which one can presumably observe evolving and developing in the manner suggested by this language?

In responding to this question, I think we may say that the concrete object the growth and development of which Schultz is trying to describe and evaluate is better called by the name of *population system*. This is a term that may be clearly defined as referring to an observable entity, and its use does not involve the user in the ambiguities and confusing overtones of such terms as "organism" or "economy."

2. Assuming that it is a human population system that Mr. Schultz speaks of as "growing and developing," I shall now consider modes of describing this object.

Let us imagine a large map of the area of this nation, and suppose that we have means of observing upon this map the locations of all the members of the population of this country. There are some 175 millions of us and each might be represented by a point on the map, or, if the map were large enough, by a poker chip.

²P. 146.

What one would see upon this map is something that may be called a density configuration. The pattern formed by the variation of density could be pointed up perhaps by arbitrarily dividing the entire area into many small sub-areas, representing, say, ten or so miles square, and putting the chips contained in any one sub-area one upon the other in the form of a column.

If we were to do this, the heights of the columns would indicate the densities for the respective sub-areas. For any origin and coordinate axes, however designated, the columns would constitute a two-dimensional frequency histogram.

Hence, it is a two-dimensional frequency histogram that one would observe. Each area or group of areas containing a city would show up on the map as a location of a density peak. One of these peaks would be seen to tower above all others. Then there would be several scattered over the area which, although half or less as high as the tallest, would tower over all the immediately surrounding peaks. Scattered about these would be lesser peaks, and about each of these latter would be peaks of still lesser heights. Around all the peaks would be sub-areas containing few or no chips. We are now referring to the spatial orientation of various heights of columns and in a vague way describing the shape and form of the frequency distribution. There is not time upon this occasion to say much about this form and shape, but there has been a good bit of speculation in regard to the specifying of the form and to explaining the regularity and stability that many observers think they see in the spatial distribution of human populations.³ I shall try to say a little, however, if only to indicate what would seem to be promising lines of research and analysis.

3. Most of the sub-areas on the map would contain no chips or only a very few and would represent areas containing no towns. Of the rest of the sub-areas, a relatively large number would each contain small numbers of chips, each such area representing the location of a village or small town. A small number of areas would each contain a relatively large number of chips, these areas representing the locations of sizeable cities. Suppose that a frequency distribution were formed by counting the number of sub-areas containing exactly x chips for each possible value of x .

To do this manually, one would follow some procedure whereby a tally-sheet would be used. He could take the sub-areas in random order and continue until all the sub-areas were accounted for. But suppose he

³I have discussed some of the literature on this subject in "A Description of Certain Spatial Aspects of an Economic System," *Economic Development and Cultural Change*, Jan., 1955, and in "Statistical Conceptions in the Study of the Spatial Structure of an Economic System," *JASA*, March, 1953, and in "The Region as an Economic Entity and Certain Variations to be observed in Studying a System of Regions," *AER*, Vol. XXXIX, No. 3, May, 1949.

were to proceed differently, viz., by randomly drawing an initial sub-area but then taking the rest of the sub-areas in an approximate order of proximity. One would begin at a randomly drawn point, so to speak, and as the number of sub-areas tallied is increased a larger and larger aggregate and connected area would be included in the sub-areas tallied.

I am trying now to indicate what would seem to be the implications—or at least what would seem to be suggested—by statements of prominent students of such population phenomena when they describe what they speak of as “systems of cities of various types.”⁴ There are those who undertake to classify cities by type, and each type is supposed to have its complement of cities or towns of lower-order type ranged about it in a regular pattern. The emphasis of my present remarks is the point that in the real phenomena that one may directly observe there is not the discreteness that is implicit in the idea, say, of a “9-type hierarchical system of cities”; but that nevertheless there is something suggestive of a hierarchical arrangement of cities of various sizes. Along with any relatively sizeable city one expects to find a regular complement of cities and towns of other sizes ranged about it, and for cities of comparable size the complement and arrangement are much the same. I wish to better specify this concept and to convey the idea in the simplest possible terms corresponding only to objects which our eyes can see. Up to the present our assumption is that we have before us the map with the spatially distributed columns of chips, and we are casting about for some way of highlighting what one may see as a pattern in the spatial orientation of these columns of various sizes.

Let us suppose that when one follows the tallying procedure outlined above he finds not only that a simple mathematical formula describes the distribution for the total area but also that the observed distribution on the tally sheet, whatever be the initial sub-area that is randomly drawn, rapidly approaches a stable form with an increase in the number of sub-areas tallied. That is, let us say that for each of two halves of the total area, the distributions are approximately similar; that for each of four quarters of the total area the distributions are approximately similar; that for each eighth, et cetera; or, generally, that any part of the total area containing a relatively large number of the sub-areas would show a size distribution of communities similar in form with that of any other comparable part.

Something much like this is said by many students of the subject to

⁴For example, see Walter Christaller's *Die Zentralen Orte in Suddeutschland*, Jena, 1933. Professor Carlyle Baskin of Randolph-Macon College, Ashland, Virginia, has translated the greater part of this book. Also, see A. Losch's *The Economics of Location*, Yale University Press, 1954, Part II, of which there is a shorter version in “The Nature of Economic Regions,” *Southern Economic Journal*, 1938.

be evident in the data. There is a curiously elementary mathematical formula that is supposed to be applicable for specifying at least one end of the frequency distribution that would thus be observed for the total area. This is the so-called rank-size rule and is expressed by $S = R^{-a}M$, where S is the size of a given city (the height of the column representing that city), R the rank of that city in an array with respect to size of all the cities, and a and M are constants. As the rule is ordinarily applied, a is assumed to be unity and M is given by the size of the largest city. That is, in accordance with this rank-size rule, the size of the 20th largest city is one-twentieth of the size of the largest city. We may note that with rank expressed as a function of size, this rank-size relationship would be a

TABLE 1. PARTIAL LISTING OF URBANIZED AREAS ARRANGED IN ACCORDANCE WITH SIZE OF POPULATION

Urbanized Area	Population (Apr. 1, 1950)	Rank
New York-Northeastern N. J.	12,223,000	1
Cleveland, Ohio	1,372,000	10
Seattle, Wash.	616,000	20
Birmingham, Ala.	439,000	30
Fort Worth, Tex.	356,000	40
New Haven, Conn.	243,000	50
Tulsa, Okla.	204,000	60
Spokane, Wash.	175,000	70
Erie, Pa.	151,000	80
Austin, Tex.	135,000	90
New Britain-Bristol, Conn.	123,000	100
Portland, Maine	113,000	110
Lincoln, Neb.	98,000	120
Sioux City, Iowa	90,000	130
Port Arthur, Tex.	82,000	140
Pueblo, Colo.	73,000	150

Source: U. S. Department of Commerce, Bureau of the Census, 1950 Census of Population: Preliminary Counts, Series PC-3, No. 9.

cumulative greater-than frequency distribution of our sub-areas classified by height of column. It could as easily be expressed as a cumulative less-than distribution, the derivative of which would be an ordinary frequency function.

Table 1 illustrates this relationship. To save time and space I have included only the largest city and every tenth of the rest of the 157 cities designated in the 1950 Census as urbanized areas.

One may easily check the extent of conformance of this array of cities by size with the formula, $S = M/R$. For example, the 10th highest column on our map would be Cleveland, and it would be approximately one-tenth as high as the tallest, representing New York. The 20th highest (Seattle) would be approximately one-half as tall as the 10th highest. Those columns representing ranks of about 100 (Schenectady, New Britain-

Bristol, Corpus Christi, Rockford) would be about one-half as tall as those representing ranks of about 50 (Richmond, New Haven, Jacksonville).

This rank-size formula is the same as that for the familiar Pareto distribution and plots on double-logarithmic graph paper as a straight line sloping downward at a 45° angle from the point on the vertical axis representing the size of the largest city. If one were to draw such a straight line for each of the 17 censuses beginning with that of 1790, he would have on the graph a family of lines which would approximately fit the plottings of city sizes against corresponding ranks for each of these decades. The impression conveyed is that of marked stability of form of the frequency distribution of the sizes of cities. As population has increased and as individuals have made their independent moves from place to place over the nation, some cities have grown rapidly, some have grown slowly or not at all, some have become smaller, and many have disappeared entirely. But with all this divergency of growth of individual cities, the maps that we might construct from census data for the various decades would each show columns of chips whose heights conform to the same numerical rule of order.

Now, this same simple formula does not hold for the cities and towns of parts of the total area. Indeed, it gives the appearance of not fitting very well for the total area except for relatively large values of R . But at best, it is only an empirical rule; and should there in fact be a stability of form of the size distribution of cities, as many have been led to believe, one may well guess that the frequency function specifying this stable form will be found to be quite complicated and that the rank-size rule represents merely a rough approximation for large values of R .⁵ Perhaps it is the complete specification of the frequency function, for which the simple expression is a limiting form for large R , that would fit the distributions for parts of the total area.

At any rate, students of the phenomena think they discern a regularity and stability in the size distribution of cities and in the spatial orientation of cities of varying size for the area as a whole and for sufficiently large parts of the total area. From the view that they take, the population as it is distributed over the United States, or over any other large populated area, appears as a system of centers representing density peaks. As one moves out from one of these centers, density does not fall off abruptly at anything that may be called an edge or limit of an area corresponding

⁵There is a suggestion of this in what is called the Yule Process. Yule, in connection with a study of evolution, derived a frequency function for computing the expected proportion of genera that contain exactly r species. This computed expected proportion is given approximately by the relationship referred to above as the rank-size rule, provided that r is large and the time elapsed in the process is long. See, G. U. Yule, "A Mathematical Theory of Evolution," *Philosophical Transactions of the Royal Society, Series B*, Vol. 213 (1924), pp. 21-87.

to the center. It declines with distance, and for major centers the decline continues for a hundred or more miles out, where typically a rise begins and continues until another major center is reached. Between major centers, density rises to and falls from smaller density peaks at lesser centers. Each major center appears as a sort of hub with lesser centers about it. The lesser centers in turn appear as lesser hubs with yet lesser centers about each of them. That which looks to be a principal central place with respect to a particular collection of centers may appear as a subsidiary central place with respect to a larger central place; and the hierarchy scales up finally to a center that is suggestive of a nucleus for the entire system.

4. We have spoken so far about only one aspect of this object called a *human population system*—the locations at an instant of time of the component individuals. In a description of this aspect, the chips representing the individuals are undifferentiated. But there are untold ways of classifying and differentiating the individuals, and let us now consider some of the more common classifications.

First, consider such a classification as by type of occupation and quality of capacity applied or by type of product or service produced for exchange. What would we see upon our map if the chips were differentiated according to such a classification?

The spacing of individuals and their clustering at central places are a spacing and clustering of complementing activities. The density peaks represent clusterings of certain types of activities, and these central places are formed into something suggestive of systems and sub-systems. We may rationalize the systematic character of this arrangement of collections of activities as follows.

Some of the individuals are engaged in activities the locations of which are determined by the locations of natural resources and thus are dispersed over space—those engaged in farming, in commercial fishing, in logging, in mining, are examples of individuals whose locations are dispersed in this manner. Now the uniformities and regularities which students purport to see in a spatial arrangement of a population system are supposed to be evident in the data whatever the continent or the time period from which the data are obtained. We shall presume then that for sufficiently large areas of the earth there is a kind of uniformity among the areas with respect to the spatial dispersion of natural resources; and I shall say a few words regarding what we may suppose to be the nature of this uniformity.

Let us say that natural resources are classified into a large number of types. For each type, it is conceivable that one might count the number of sub-areas which contain this natural resource in usable amounts. Let all

the natural resources be arrayed with respect to this number. At one extreme of this array would be a class of natural resources each member of which is found in virtually all of our sub-areas. These are the ubiquitous resources which are found nearly everywhere and which need never be hauled but short distances. At the other extreme of the array would be a class of resources each member of which is found in only one or a very few sub-areas. These are the "strategic" resources. There may be many members of this class, but any one of them is found in only a very few places. Members of this class that are widely used are hauled relatively great distances. Between these extremes there would be other classes of resources, ranging from those that are found in most places to those that are found in few.

Now let us consider how the sub-areas may vary with respect to their natural endowments. First, a sub-area may contain a smaller or larger number of different types of resources; and we suppose that a large proportion of sub-areas contain only the ubiquitous resources, that a somewhat smaller proportion contain, in addition to the ubiquitous, some of the middle-range resources, and that a very small proportion contain, in addition to the ubiquitous and middle-range, one or more of the "strategic" type of resources. Second, a sub-area may contain a higher or lower total quantity of natural resources—measured, say, by something like the f. o. b. value; and again we suppose that a relatively large proportion of the sub-areas contain small amounts of resources and a relatively small proportion contain large amounts.

Of the ten to twenty or so thousand sub-areas within a continent, each would contain some combination and some value of resources, and as indicated above the distribution of this population of sub-areas with respect to their natural endowments would be very skew. Now suppose that this population of sub-areas were randomly distributed over the total area. Then any region or zone consisting of a large number of contiguous or connected sub-areas would be endowed with natural resources in about the same way as any other. But while there is an appreciable likelihood that any large area or region will contain resources belonging to that class any member of which is found in only a few sub-areas, the particular members of this class that are found in a given region are in general different from those found in other regions. That is, each region, containing a relatively large number of sub-areas, is characterized by a unique combination of "strategic" resources, and these are components of the products that are hauled long distances.

So much then for the dispersion of natural resources over the total area. Individuals who exploit and mine these resources are of course similarly dispersed.

These dispersed individuals are serviced and supplied from central

places, and these are the towns and cities of the widely varying sizes, represented by the columns on our map. The individuals who are located in the smallest central places typically produce a very limited number of consumer goods and services, each with a small market range, a high per capita consumption, a small producing organization, and requiring only generally prevalent skills. Some of the individuals are perhaps engaged in the assembling and shipping of the products of the dispersed individuals. I shall not try to propose a way for doing so, but I suppose that the chips representing these individuals in the smaller towns could be differentiated in some way to indicate the type and grade of occupation constituting the source of income.

Several of these smaller places are scattered about a somewhat larger place. The individuals in this larger place produce, in addition to the types of goods and services produced in the smaller places, goods with larger market ranges. Also, there would typically be rudimentary processing operations, and perhaps there are individuals who supervise the activities of individuals located in several of the smaller places. Thus, there would be in the column representing this next-sized place chips of the same kinds found in the smaller column; but in addition there are chips with differentiations not found in the smaller column.

The same may be said about the next larger place, and the next and the next. The columns for the large cities show many differentiations among the chips, and the number of these differentiations declines with the size of the city. Whatever the size of the place, there would be occupations in it similar with respect to grade and type of capacity required of the occupations found in any of the smaller places. The larger the place, the more the kinds of products and services produced, the greater the proportion of individuals engaged in administering the operations of individuals located in smaller places, the higher the quality of the professional services available within it, the greater the number and the more distant the places from which products are assembled, the greater the number and the more distant the places to which products are sent.

This differentiation of the chips would show an additional aspect of what we are calling the population system. This aspect would be observed in the characteristically different compositions of types of activities and qualities of capacities in the various sizes of cities and towns.⁶ Processing and manufacturing activities are of course not typically found in the outlying dispersed sub-areas. And in these dispersed areas, division of labor

⁶In passing we may note one further point. Suppose the differentiation of the chips included also information upon the "age" of the product constituting the source of income—i.e., the number of years during which the form of the product had been the same as at present. The chips representing the dispersed individuals would show that the form of their products had remained unchanged for ages. On the other hand, in the cities, where the unchanging raw materials are assembled and combined into finished articles of a multitude of forms, many of the individuals work upon prod-

and specialization in goods and services locally consumed is pursued to a much less extent than is the case in cities, and the larger the city the greater this extent. Accordingly, less of the goods and services consumed by individuals in the dispersed areas and small towns are exchanged and thus evaluated in terms of money, and in this sense we may say that the degree to which the activities and products of individuals are "monetized" is least in the dispersed areas and increases with the density of individuals or with the size of cities.

5. Let us now consider the basis for classifying individuals which is perhaps the most familiar of all. Suppose the chips were differentiated in some way to indicate the sizes of the money incomes of the corresponding individuals. We know of course what pattern of variation would be observed upon our map. As indicated above, cities of a given size contain individuals who perform the same kinds of services and exercise the same kinds of talents and capacities as any of the individuals contained in smaller cities and towns. But in addition, the larger city contains individuals performing administrative and professional services that are not found in the smaller communities, and there are individuals exercising capacities in the larger city for which there are no counterparts in the smaller. Moreover, in the larger city, the producing organizations are larger and more mechanized so that the amount of capital per individual is larger than in small cities and towns, and the individuals whose incomes are supplemented by the yields of this capital live predominantly in large cities. Also, as commented upon above, the extent to which the division of labor has been carried and to which consumer goods and services are exchanged for money is greater in the large city than in towns and dispersed areas, and thus a given level of consumption of real goods and services corresponds to a somewhat higher level of money income in the large city than in the town and outlying area. All of which would indicate that the larger the city the higher the average income of the inhabitants.

Thus, were we to start with one of our taller columns (large cities) and consider the sub-areas surrounding it—say, by taking the sub-areas in concentric belts—we should find that average family income declines as distance from the center is increased until the area within the range of the adjacent large city is reached. And this is so in the East or West, North or South. At least for white families, average incomes for cities of similar size are approximately the same in different parts of the country.⁷

ucts the forms of which were created only a short time ago. And this too is characteristic—it is the cities in which one finds newness of forms of products, processes, and services. Perhaps it is this to which Mr. Schultz refers when he speaks of "locational matrices, urban in composition" as "centers in which development occurs."

⁷ Cf., D. Gale Johnson's "Some Effects of Region, Community Size, Color, and Occupation on Family and Individual Income," *Conference on Research in Income and Wealth*, National Bureau of Economic Research, 1950.

This has a bearing, of course, upon the interpretation of comparisons of per

6. In what we have said, we have tried to describe a structure having form and shape that one may observe as it exists at an instant of time—a distribution over space of differentiated individuals. Let us now consider certain motions and movements that may be observed in connection with the population system. Lines of transport and communication connect the density peaks in our system, and along these there are continuing flows of goods and messages and people. Were we to be stationed at some point on a line of transport connecting two great centers and under such circumstances that for each unit of value which passes that point we could determine its origin and destination, we could form a pair of frequency distributions of these value units—classifying the units by distance from origin, on the one hand, and classifying the same units by distance from point of destination, on the other. We shall interpret data which we mention below as suggesting that the distributions would look about the same whatever the point selected for the observations. Over the length of a great line of transport, the volume of traffic or cargo seems to remain more or less constant. But only a small portion of this volume as it would be observed at any point passes over a long distance. There is a continuing adding-to and dropping-out process, with the bulk of shipments going relatively short distances, and the distance distributions that we might observe at any point along the way would have forms that would look much the same whatever our point of observation.

Any one of the centers, represented on our map by a column of chips, is an origination point for goods and services produced in and around the center. A large proportion of this production is consumed in and about this center, but a substantial part is sent out to other areas for exchange with which to purchase the special products and services of individuals in other sub-areas. It is conceivable that for each unit of value output of the individuals in and around a center we could know the distance to the site at which this unit was consumed; and for all the units produced over a given period, this information could be presented in the form of a frequency distribution.

capita incomes by States. The boundaries of some States divide off parts of the population system consisting almost exclusively of small cities and towns and dispersed areas, and the population included within such States constitutes outlying parts of sub-systems centering in large cities in adjoining States. On the other hand, the boundaries of other States divide off a part of the population system consisting largely of great cities.

Such being the case, the individuals in low-per-capita-income States may conceivably be receiving higher incomes on the average than individuals in comparable parts of the population system located in high-per-capita-income States. And under such circumstances, national legislative measures to promote or subsidize increases in the incomes of families who happen to live in the States with low per-capita incomes are discriminatory against families living in small towns located in States containing large cities.

Now the data that are available suggest that were we to do this for all the centers, the respective distributions would be much alike and of regular form (e.g., it would seem that a logarithmic normal distribution would fit such distributions), and would also be stable from time period to time period. There are data on parts of the shipments from centers. For example, information is available upon origination and destination of carload rail shipments, and these data are classified by States. There is a marked similarity between the distributions of different States, even though one chooses States that he might expect to show great differences—States which differ widely in degrees of urbanization, sizes and shapes of areas, general topographies, and degrees and characters of economic specialization. The carloads originating in a State presumably originate in some city or town within the State; and if we were to consider the set of all cars originating in some given State, say Michigan, these cars could be classified by city and town. And there is a plausible interpretation of the State distribution as a kind of weighted average of the distributions for the various cities and towns within the State. The close similarity between the distributions of States that differ greatly with respect to the sizes of their cities suggests a similarity among cities of different sizes with respect to their distance distributions for this component of their shipments and receipts.⁸

But there is an important difference among States in the commodity composition of the long-distance part of the distribution. In the short distance ranges of all the distributions are found about the same commodity groups. But as one moves along the distance scale there is more and more divergency among the States with respect to the commodity groups represented in their respective distributions. The long-distance ranges indicate the specialization of the area, and in the sparsely settled areas this specialization is confined to a smaller number of commodity groups than is the case for the areas containing the larger central places.

7. In terms of frequency distributions, we have attempted to describe various aspects of the form and pattern observable in the structure of a human population system. Two types of these distributions have been considered as describing physical features of spatial structure of the system. One of these specifies the density configuration of the loci of the individual members at any instant of time. The other type of distribution pertains to the destinations of the value-output flows emanating from each point within the system.

It was suggested that the distributions are characterized by forms that may be given analytical expression and that while changes of conditions

⁸I have considered these data in detail in *op. cit.*, *Economic Development and Cultural Change*, January, 1955, pp. 174-182.

over the course of time have affected the parameters of these distributions, the forms have been more or less insensitive to these changes in conditions. For example, the cumulative greater-than size distribution of cities in 1950 when plotted upon double logarithmic graph paper appears as a straight line sloping downward at an angle of approximately forty-five degrees. Given the slope and the intercept on the vertical axis, one may quickly draw off a line from which may be read the number of cities containing more than some specified number of people. This is only an empirical "fit," and no analysis has been presented on the basis of which one may infer and rationalize a precise form of this distribution. But with an appropriate adjustment of the two parameters, the intercept and slope, the distribution for any other decade since 1790 would be given approximately by the straight line; and one might hazard with some degree of confidence a straight line describing the size distribution for 1960 or for 1970. Moreover, there are reputable persons who maintain that the size distributions of the cities of "systems" located on other continents and in other historical periods are similarly fitted by the same form of distribution. As another example, the cumulative less-than distance distribution of car-load lots of freight plots as an upward sloping straight line on logarithmic probability paper. And evidence suggests that this distribution is also stable over time and from area to area at the same time. Again, one may feel some degree of confidence in describing the distribution for next year by drawing such a straight line. And it was conjectured that some stable distribution would be found if we had data for a large center indicating the destination of each unit of value-added produced in and around the center.

These, of course, are only tentative descriptions and hypotheses regarding the stability of forms of distributions. But if for the present we may assume that some process of development leads in the limit to stable distributions of the sort that we have described, we shall wish to emphasize that although the distributions are stable, the individual units within the distributions are always shifting and changing and in a continual state of flux. The regularity and order pertain to the population system as an entity. Considering the happenings over any period of time, we know that there are some individuals who die and pass out of existence, others who are born and created anew. In regard to any central place, there are families moving away and settling in other places while other families are moving from other places into this central place. In all places, there is a continuing birth and death, adding-to and dropping-out process. But through all of this internal and individual flux, the system as a whole is maintaining a kind of stability.

One may imagine a sequence of maps such as we have been discussing

which would demonstrate the individual flux within a system maintaining a stability of form. A column of chips representing a central place upon our map as it would stand today will consist of chips some of which would have been found in other columns on a map depicting the situation existing a year ago. Census data describe some of this. Eighty-one per cent of the individuals in this country lived in the same houses in 1950 which they occupied in 1949; about 11% lived in different houses but in the same counties; and about 6% lived in different counties.⁹ Over a longer period, of course, more of the population are found to have moved about. In 1947, 43% of the population lived in the same houses which they occupied in 1940; 36% lived in different houses in the same county; 11% lived in different counties within the same states; 4% lived in contiguous States; and 6% lived in States not contiguous to the 1940 States of residence.¹⁰

8. Thus, the individuals are not at "rest," nor are they ever "tending to a state of rest." They are in a continuing state of motion. But over any period of time their distribution among arbitrary small areas into which the total area may be partitioned tends to maintain a regular and stable form. This is the kind of situation described by the idea of *statistical equilibrium*.

Discussions familiar to all economists imply this idea. Most persons who have worked with the data expect to find a distribution of typical form when the incomes of families are arranged by size. Many would feel confident that if given as many as two parameters of the distribution they could construct a close approximation of the entire distribution. Now the conjecture is not infrequently expressed that if existing wealth were arbitrarily apportioned among all the families so that in an initial period each family receives the same income, and if in subsequent periods each family is allowed to choose its mode of using its resources and capacities, then it would only be a matter of time before income would again be distributed in accordance with the form which described the distribution prior to the arbitrary change. The family units would be differently placed within the distribution; but a shifting of individuals within the distribution would occur in time even though no arbitrary change were made. Whatever is done, individuals move along the scale, passing from income class to income class. The form of the distribution that is thought by many to be typical and stable will be stable only if these passages of individuals are mutually compensatory when this particular form is established. This is a limiting form, representing an equilibrium situation, if a disturbance which alters the form of the distribution renders the passages of individ-

⁹ 1950 Population Census Report P-B1, Table 70, pp. 1-121.

¹⁰ "Internal Migration in the U. S.: April, 1940; to April, 1947." *Current Population Reports*, Series P-20, No. 14, Dept. of Commerce, pp. 2, 13.

uals from class to class no longer compensatory but such that the initial form tends to be again restored.¹¹ This may or may not be so for our case of the income distribution, but all of us are familiar with statements in this context implying this conception of statistical equilibrium.

In the case of the movement of individuals, the apparently stable size distribution of central places is suggestive of such a statistical equilibrium. Through a continuing process of births, deaths, movements into and movements out of designated small partitionings of a large area, a particular form of density configuration is established. The passages of individuals from sub-area to sub-area do not alter this form. But suppose that the form of the distribution were arbitrarily altered—for example, suppose that by a decree issued by some all-powerful authority individuals and equipment were physically moved about so that all central places were made the same size and with the understanding that once they were made this size, property would be divided among the individuals and everyone could do as he chose subject to ordinary laws. Then these passages of individuals would tend to change this arbitrarily established distribution. And if the original distribution does in fact conform with the idea of a state of statistical equilibrium, then the arbitrarily established equal distribution of individuals among designated sub-areas would be changed, through the occurrence of undirected individual passages from sub-area to sub-area, back to the original distribution. This would not mean a re-establishment of the old cities but rather a development in time of a system of central places having the same general features of form.

9. This idea of statistical equilibrium is being raised here for brief discussion in order that we may consider and speculate upon the kind of analytical problem that confronts a student of the phenomena that we have attempted to describe. If we have in what we would observe upon our map or series of maps an empirical counterpart of this concept of statistical equilibrium, our problem is that of analyzing a time-dependent stochastic process. This is surely not my specialty and I have no analysis to present, but I shall continue for a few paragraphs and try to illustrate some of the ideas.

One need only reflect upon the present residences of those with whom he was raised in order to be reminded of the extent of the mobility of human beings. I should think my own experience is not unusual, and in the course of 25 years I have moved my residence a number of times. When I recall the chance happenings which apparently determined my

¹¹ The idea is that of a stochastic process possessing ergodic properties. Cf. William Feller, "On the Theory of Stochastic Processes, with Particular Reference to Applications," *Berkeley Symposium on Mathematical Statistics and Probability*, Berkeley, 1949, p. 418.

various moves, it seems not unreasonable for me to look upon my present residence as the result of a sequence of chance occurrences. Let us consider the meaning, then, of a statement that some chance process determines the distribution of individuals over an area such as that of this nation.

To demonstrate the idea, we shall think first of the simplest conceivable physical conditions, with no intention of making the conditions realistic. We shall then discuss certain modifications in the interest of realism.

Let us again think of the large map of this country upon which are to be placed r chips representing the family and individual units constituting the population. Let the total area be partitioned into N sub-areas, numbered 1 through N . Let a number be randomly drawn for each chip, the number to indicate the sub-area into which the chip is to be placed; and let the drawing be with replacement and such that the chance of any chip's being placed in one sub-area is the same as it is for any other.

As a result of the sequence of r draws, there will be sub-areas containing 0, 1, 2, 3, . . . chips. And there would be an expected proportion of all the sub-areas which would contain exactly k chips, this proportion being given by the well-known Poisson formula.

Now suppose that this experiment were performed in each of a succession of time periods. That is, let us say that at the beginning of each time period, each of the r chips is assigned to a sub-area in accordance with the procedure outlined. The location of each chip could be recorded for each time period, and the movements of the individual chips could be traced. And one may calculate the expected relative frequency of moves of each possible distance.

Now the expected proportion of sub-areas containing exactly k chips may be calculated. And if the total area were divided into several large parts—twenty or thirty or so—then, if N and r are sufficiently large, within any of these parts the proportions of places containing k chips would be given approximately by the same formula as for the total area. That is, among the geographic divisions or departments the range of height of the columns would be about the same, and the number of columns of a given height for each column of some other height would be about the same for one geographic part as for another. It is conceivable that one who only observes the results of one distribution would interpret what he sees as a "system of places," each "larger" place being associated with some number of "smaller" columns.

However, there would be no stability or continuity from period to period in the height of a given column. A concentration may build up in one period and vanish in the next, and moderate sized rates of growth and decline would be virtually non-existent.

Note that attention has been called to four quantitative aspects of the outcome of the process: the first has to do with the mobility of individuals constituting the population; the second with the size distribution of the columns at any point in time; the third with the spatial orientation of the columns of various sizes; and the fourth with the growth and decline of the populations of the sub-areas. A particular performance characteristic has been attributed to the process corresponding to each of these quantitative aspects.

Let us now modify the experiment. In the above illustration it was assumed that in each period the chance of a given chip's being placed in one sub-area is the same as the chance of its being placed in any other, viz., $1/N$. On this assumption, the chance of a chip's remaining in a sub-area from one period to the next is this small number $1/N$. But it was noted earlier, that only 2 out of 10 persons moved at all between 1949 and 1950 and that 1 of these 2 moved no farther than from one house to another within the same county. Only about 1 out of 10 persons moved far enough to change his county of residence during that year, and most such moves were to nearby counties.

It would be in keeping with experience, then, for us to construct the urn schema in such a way that the chance of a given chip's moving to a particular locality would be made to depend upon the distance of the locality from the present location of the chip. That is, with all other conditions the same, we should make the probability of a move vary inversely with the distance of the move.

But sub-areas differ, of course, in respects other than distance from a given point. On the one hand, they differ in their natural endowments—proximity to lines of transport, quality of soils, climate, accessibility of minerals, et cetera. These would be initial differences that are independent of the process. On the other hand, there are differences which result from a process of settlement. It seems plausible to assume that the presence of individuals within a sub-area increases the chance that this sub-area will be subsequently selected as a residence by other individuals. The activities of individuals are mutually dependent, and the establishment of one kind of activity within a neighborhood involves the construction and use of facilities that may be jointly used by other individuals. Initially, there are natural differences among sub-areas that are virtually independent of the process of human settlement, and the chance of a move being made from a particular sub-area to a sub-area lying at some given distance may be greater or less than the chance of a move to some other sub-area lying at an equal distance. As moves take place from period to period, these probabilities would be altered.

In the construction of our model, let us say that an urn and ball schema is prepared for each sub-area containing any chips. The experiment, as we conceive it, would consist of a draw of a ball for each chip at the end of each period, the number on the ball indicating the location of the sub-area which will contain the chip during the next period. Each sub-area, as a possible location of the chip in the subsequent period, would be represented in the urn not by one ball but by a number of balls. This number of balls would vary from sub-area to sub-area: directly with the degree of attractiveness of the natural endowments of the sub-area; directly with the number of chips presently occupying the sub-area; inversely with the distance of the sub-area from the locality for which the urn is being prepared.

Let us first consider that aspect of our model which we may suppose to correspond to the natural variation among localities in regard to physical resources. In section 4 above we have already considered the respects in which sub-areas differ in their natural endowments and the senses in which regions containing large numbers of sub-areas may be said to be similar and dissimilar in this regard. In accordance with those considerations and denoting by z_i some measure of the quantity of resources included in the natural endowment of the i th sub-area, we conceive of the distribution of z as being strongly skewed, a relatively large proportion of the sub-areas having small values for z and a relatively small proportion of the sub-areas having large values for z . There being ten thousand, more or less, sub-areas into which the total area is divided, there are this number of z values and this number of compositions of the various classes or types of resources. These we think of as being randomly distributed over the total area so that any region or zone consisting of a large number of contiguous or connected sub-areas will contain a distribution of z values and a composition of the different classes of resources which will be approximately those of other regions or zones of similar size.

So much for the spatial distribution of natural endowments. Denote by n_i the number of individuals located in the i th sub-area. Initially, then, each sub-area will have a value for z and a value for n . Consider now the making up of the urn for the chips presently located in some given sub-area. Let d_i be the distance of the i th sub-area from this sub-area for which the urn is being prepared. There are now three variables: z , n , and d . Let k_i be the number of balls placed in the urn for the i th sub-area. In the preliminary construction of our model experiment, we would make k vary directly and proportionately with some increasing functions $f(z)$ and $g(n)$ of the variables z and n and inversely and proportionately with some increasing function $h(d)$ of d . That is, the k for this urn would be made to

satisfy the relation

$$k_i = \frac{Af(z_i)g(n_i)}{h(d_i)}$$

The function $h(d)$ would be so chosen that the chance of a move to a given distance zone would vary inversely with distance. Each distance zone, if it contains a large number of sub-areas, will contain about the same relative composition of z values as that found in any other distance zone of large size. But the number of sub-areas contained within a distance zone increases proportionately with distance. Hence, if the chance of a move being made to a distance zone is to be made to vary inversely with distance, then allowance must be made in $h(d)$ to offset the effect of the increasing number of sub-areas as d increases.

We might assume that in the initial period the total area under consideration is empty of individuals. That is, in this first period the sources of migrants would lie outside of the area. For example, in the early part of the 16th century, this continent was virtually empty of Europeans. The central places of Western Europe from which migrants subsequently came would be represented in our model by columns of chips spaced over an area external to the area representing the empty continent. The location of each chip would be subject to change in each period, and there is a chance that some of these moves would carry over into the area which initially is assumed to be unpopulated.

The experiment would consist of the operation of this model over a long sequence of time periods. In each time period a ball would be drawn from the appropriate urn for each chip, and the location of each chip is thus redetermined period by period. The results recorded for the first period are chance events depending upon the initial conditions: the initial spatial distributions of the z and n values. The results for subsequent periods are chance events depending also upon the happenings in previous periods. The draws of the first period would result in an alteration of the n 's corresponding to the various sub-areas; and the expectation would be that movements of chips would be made to some of the sub-areas of the initially empty area. And we may allow for an additional source of change of the n_i . Some systematic birth and death process of the individual chips may be introduced whereby the aggregate number of individuals n_i would also be subject to change.

With each change of the set of n_i , the system of urns would be adjusted. Period by period the development would proceed. For any period, the size distribution of the columns could be observed—that is, the number of columns containing exactly x chips. If the experiment were realistically designed, a particular form of this distribution presumably would be observed for the new area after the process had continued for a while. This

corresponds to what we speak of as the process of urbanization of a population. In each period there would be observed a distribution of individual moves classified by length. This would be descriptive of one aspect of the mobility of the population. The spatial orientation of the columns of various sizes could be observed, and after a number of time periods there would presumably be observed a particular pattern of this spatial distribution. That is, for any part of the total area containing a large number of sub-areas there would be expected values of the numbers of columns of the various sizes. During the course of the process, there would be observable a distribution of rates of growth or decline of the individual columns, and this distribution would presumably also tend to assume some stable form.

Thus, there are the four features of structure and development mentioned above: (1) the size distribution of cities; (2) the spatial distribution of the cities of various sizes; (3) the distance distributions of the movements of individuals from place to place; (4) the distribution of the growth rates of the populations of central places, sub-areas, and regions. (1) and (2) have to do with degrees of urbanization, (3) with the mobility of the population, and (4) with divergencies in rates of development. We mentioned above other aspects of variation which are not included in our model—e.g., variation among communities of different sizes with respect to types of occupations, grades and qualities of capacities exercised by the members of the populations, and incomes of these members. But perhaps some elaboration of such a model can be found that would yield expected values of variables describing these features of variation also.

In the real population, each individual during his waking life apparently is engaged in a decision-making process. He consciously weighs and judges the expected consequences of alternative actions which are possible under a given system of physical and institutional constraints. But in the construction of our model experiment, we abstract from this individual decision-making process—for this does not pose the problem before us—and we assume that the results of millions of individuals making rational choices are substantially the same as though the individual movements were chance events.¹² The problem of political economy is posed not by the necessity of an individual making a choice under a given system of constraints but rather by the necessity of a society of people making a choice among alternative possible systems of constraints. To evaluate a system

¹² One may note that this kind of assumption is also made by analysts of traffic flow phenomena. Presumably, the drivers of automobiles each rationally chooses his routes, rates of speed, times of trips, et cetera. But the models constructed for explaining the striking regularities and uniformities in this flow phenomena are probabilistic models which include no explicit assumption regarding individual decision-making.

of constraints which is subject to change and improvement through legislation is to compare the working properties of this system with those of alternative systems. These are population characteristics that are described in terms of limiting forms of distributions such as the four mentioned above. Presumably, legislative policy is designed to change the constraints upon private actions so as to affect limiting forms of various distributions. The acceptance by a society of a proposed alteration in the system of legislative enactments involves predicting the performance of the proposed new system.

10. These last remarks bring us back to the case of Mr. Schultz with which we began this discussion. Our purpose has not been to raise issues regarding the truth, reliability, or wisdom of the statements, judgments, and evaluations which Mr. Schultz expresses in the works cited. Our object has been to clarify the meanings of certain terms and concepts. Mr. Schultz speaks as though he observes divergencies in growth rates and differences in averages of family incomes which are significantly larger than *expected* divergencies and differences for a "system" that is working as it *should* work. I have tried to describe the object or thing upon which he has made the measurements which have induced in him the belief that observed divergencies are *excessive*. And I have considered in a tentative and halting way how one might go about studying the notion of *expected* divergency and *expected* variation in a "system" that is working as it *should* work.

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AGRICULTURE IN REGIONAL ECONOMIC GROWTH

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I

DESPITE the existence of a few dissenters there seems to be agreement amongst many economists that agriculture contributes little to economic growth. The argument has developed along two lines: The first equates economic growth with an industrial revolution and argues that a "take off" into industrialization "fails to occur mainly because the comparative advantage of exploiting productive land and other natural resources delays the time when self-reinforcing industrial growth can profitably get under way.¹ The argument stems from the classic view of diminishing returns in agriculture, the greater productivity of manufacturing and the difficulties associated with the shift of resources into secondary activities when diminishing returns obtain.²

The second argument is quite different and indeed stems from different theoretical underpinnings.³ It has been most cogently stated by Professor Theodore Schultz as the following hypothesis: "(1) Economic development occurs in a specific locational matrix; there may be one or more such matrices in a particular economy. This means that the process of economic growth does not necessarily occur in the same way, at the same time, or at the same rate in different locations. (2) These locational matrices are primarily industrial-urban in composition; as centers in which economic development occurs, they are not mainly out in rural or farming areas although some farming areas are situated more favorably than are others in relation to such centers. (3) The existing economic organization works best at or near the center of a particular matrix of economic development and it also works best in those parts of agriculture which are situated favorably in relation to such a center; and it works less satisfactorily in those parts of agriculture which are situated at the periphery of such a matrix."⁴ This hypothesis in effect states that it is industrial development which is the prime mover in economic growth and that agriculture is a

¹W. W. Rostow, "The Takeoff into Self-sustained Economic Growth," *The Economic Journal*, Vol. LXVI, March, 1956, p. 28.

²The whole stage sequence of regional growth implicitly accepts this argument. See E. M. Hoover and J. Fisher, "Research in Regional Economic Growth" in *Problems in the Study of Economic Growth* (New York: National Bureau of Economic Research, 1949).

³The notion of diminishing returns is conspicuously absent. It is imperfections in the factor market rather than a relatively fixed factor supply which is strategic to the argument.

⁴Theodore Schultz, *The Economic Organization of Agriculture* (New York: McGraw-Hill, 1953) p. 147.

dependent variable in the overall pattern of industrial urban growth.

I find parts of both hypotheses attractive and indeed there is abundant evidence to support particular illustrations that add weight to them.⁵ Yet neither will stand generalization either in historical application or as policy guides in contemporary problems of economic growth. In this paper I shall argue that the successful production of agricultural (or indeed most extractive) commodities for sale without the region can be and under certain conditions has been the prime influence inducing economic growth, the development of external economies, urbanization, and eventually industrial development.

The argument baldly stated is as follows: (1) Specialization and division of labor have been the most important factor in the initial expansion of regions. (2) Production of goods for sale without the region has induced this specialization and (3) involvement in the developing international economy (or national in the case of some regions in the United States) of the past two centuries has been the way by which regions and nations have accomplished economic development. The argument is of course the classic one of Adam Smith as succinctly restated recently in the title of an article by George Stigler, "The Division of Labor is Limited by the Extent of the Market."⁶ While I have no quarrel with Schultz that manufactured goods (and particularly fabricated as contrasted with processed goods) have enjoyed the most rapid expansion in demand in recent U. S. economic history, in contrast to the income inelasticity in demand for farm goods, the expanding demand for agricultural goods in the 19th century and the prospects for many primary commodities in world agriculture in the present century makes the case of the United States (and some other industrial nations) in recent years atypical. Whether we look at Denmark between 1865-1900,⁷ the Pacific Northwest between 1880-1920,⁸ the Canadian economy between 1900-1913⁹ or indeed any of a myriad of other possible illustrations, it has been the expansion from one or more agricultural commodities which has been the prime mover in initiating expansion. Since I have discussed the role of export industries in promoting regional economic growth in an earlier article in the *Journal of Political Economy*,

⁵ See Rostow, *op. cit.* for supporting evidence. In connection with the United States, however, see my critical note, "A Note on Professor Rostow's 'Take-off' into Self-sustained Economic Growth," *The Manchester School*, January, 1958. In connection with Schultz's thesis see Anthony Tang, *Economic Development in the Southern Piedmont 1860-1950* (Chapel Hill: University of North Carolina Press, 1958).

⁶ *Journal of Political Economy*, Vol. LIX, June 1951, pp. 185-193.

⁷ A. J. Youngson, *The Possibilities of Economic Progress* (Cambridge, The University Press, 1959, pp. 191-230).

⁸ See the brief description in my article "Location Theory and Regional Economic Growth," *Journal of Political Economy*, Vol. LXIII, June, 1955.

⁹ G. M. Meier, "Economic Development and the Transfer Mechanism," *Canadian Journal of Economics and Political Science*, XIX, Feb., 1953.

an extended discussion here is unnecessary.¹⁰ However, my original argument was incomplete. While the expansion of an export industry is a necessary condition for regional growth it is not a sufficient one. I should like to take this opportunity to elaborate the argument before returning to a specific rebuttal of the two hypotheses outlined above.

II

The first step in the analysis of regional economic growth consists of an exploration of the determinants of the export sector of the region. However, a necessary additional step is to examine the disposition of the income received from without the region. Certainly one of the perplexing problems in the study of economic growth has been the differential progress as amongst different regions resulting from an increment to income from the export sector. Why does one area remain tied to a single export staple while another diversifies its production and becomes an urbanized, industrialized region? Regions that remained tied to a single export commodity almost inevitably do not achieve sustained expansion. Not only will there be a slowing down in the rate of growth in the industry which will adversely affect the region, but the very fact that it remains tied to a single export industry will mean that specialization and diversion of labor are limited outside that industry. Historically it has meant that a larger share of the populace has remained outside the market economy. The answer lies (a) in the natural endowments of the region (at any given level of technology), (b) in the character of the export industry, and (c) in changes in technology and transfer costs. It is worthwhile to examine each of these in turn.

The natural endowments of the region dictate the initial export commodities of the area. If these endowments are such as to result in a tremendous comparative advantage in one commodity over any other, then the immediate consequence will be for resources to concentrate upon its production. If, on the other hand, the region has broad production possibilities such that the rate of return upon the production of a number of goods and services is not too much less than upon the initial export commodity, then with the growth of the region and accompanying change in factor proportions the production of other goods and services is likely to be a simple process.

The character of the export commodity in influencing regional growth is more complicated since there are several facets to it. A number of important consequences stem from the technological nature of the production function. If the export commodity is a "plantation" type commodity

¹⁰ In addition to the original article, "Location Theory and Regional Economic Growth, *loc. cit.*", see the discussion with Charles Tiebout in the same *Journal*, Vol. LXIV, No. 2, April, 1955, pp. 160-69.

which is relatively labor intensive and in which there are significant increasing returns to scale, then the development will be in marked contrast to one in which the export commodity may be produced most efficiently on a family-size farm with relatively less absolute amounts of labor required.¹¹ In the first case there will tend to result an extremely unequal distribution of income with the bulk of the population devoting most of their income to foodstuff and simple necessities (much of which may be self-sufficient production). At the other end of the income scale, the plantation owners will tend to spend most of their income upon luxury consumption goods which will be imported. In short, there will be little encouragement of residentiary types of economic activity. With the more equitable distribution of incomes, there is a demand for a broad range of goods and services, part of which will be residentiary, thus inducing investment in other types of economic activities. There will tend to develop trading centers to provide a wide variety of such goods and services, in contrast to the plantation economy which will merely develop a few urban areas devoted to the export of the staple commodity and the distribution of imports.

A natural consequence of the divergent patterns described in the previous paragraph will be the attitude towards investment in knowledge.¹² Under the plantation type with very unequal income distribution, the planter will be extremely reluctant to devote his tax monies to expenditures for education or research other than that related to the staple commodity. As a consequence skills and knowledge not directly related to the export commodity will be at a low level. In contrast, the region with more equitable income distribution will be well aware of the stake in improving its comparative position through education and research and will accordingly be willing to devote public expenditures in these directions. The result will be to relatively improve its comparative position in a variety of types of economic activity and therefore broaden the resultant economic base.

Equally important is the investment induced by the export commodity or service. If the export is such as to require substantial investment in transport, warehousing, port facilities and other types of social overhead investment, then the external economies are created which facilitate the development of other exports. Furthermore, if the export industry induces growth of subsidiary industries and if technology, transport costs and resource endowments permit these to be locally produced rather than imported, then this will induce further development. Both in the case of

¹¹ This argument has been explored by R. E. Baldwin in some detail. See "Patterns of Development in Newly Settled Region," *The Manchester School of Economic and Social Studies*, Vol. XXIV No. 2, May 1956, pp. 161-79.

¹² I am in Professor Schultz's debt for focusing my attention on this problem in the course of a series of very stimulating discussions this past Spring.

social overhead investment and investment in subsidiary industry the consequence is to promote urbanization and increased specialization and development of additional residentiary activity geared to the increasing local demand for consumption goods and services. At the other extreme is the export industry which requires only the immediate development of a few centers for the collection and export of the commodity and entails the development of little subsidiary industry or perhaps entails the development of such subsidiary industry and marketing facilities, but they are of a nature to be most efficiently imported.¹³

Changes in technology and transport may completely alter the region's comparative advantage either favorably or unfavorably.¹⁴ Technological change may increase the potential rate of return in the production of other goods and services and lead to the exploitation of new resources and a shift of resources away from the old export industry. The initial development of transportation facilities to implement the export industry tends to reinforce dependence upon it and inhibit more diversified economic activity in several ways. The early development of transport typically (under competitive conditions) leads to a rapid fall in the transport rate and therefore increases the comparative advantage of the export commodity.¹⁵ Moreover, with newly settled regions the transportation is typically one way. The outward shipment of a bulky product having no counterpart in the inward shipment which must be made mostly empty or in ballast. In consequence, inward freights are very low and compete with locally produced goods. As a result a good deal of local industry which had been protected by high transport costs or might develop if high transport costs continued, faces effective competition from imports.¹⁶ In summary the disposition of income earned from export industry plays a decisive role in the growth of the region. Related to this argument is the region's propensity to import. To the extent that a region's income directly flows out in the purchase of goods and services rather than having a regional multiplier-accelerator effect,¹⁷ then it is inducing growth elsewhere, but reaping few of the benefits of increased income from the export sector itself.

¹³ In part at least, therefore, the development of subsidiary industry depends upon the first point discussed above, the natural endowments of the region.

¹⁴ A further discussion of this point is to be found in my article, "Location Theory and Regional Economic Growth," *loc. cit.*, pp. 254-56.

¹⁵ See my article "Ocean Freight Rates and Economic Development 1750-1913," *The Journal of Economic History*, December, 1958, for a discussion on this point.

¹⁶ The early sanguine hopes of Gallatin and Tench Coxe which rested upon the burgeoning development of manufacturing during the Embargo as reported in the 1810 census was in good part for the local market and completely unable to compete with imports following the end of the 2nd War with England.

¹⁷ See J. S. Dusenberry, "Some Aspects of the Theory of Economic Development," *Explorations in Entrepreneurial History*, Vol. III, No. 2, December 1950.

Let me briefly illustrate the argument of the preceding pages by contrasting the economic structure of the South and the West in the years prior to the Civil War.¹⁸

Both regions enjoyed a thriving export trade in the years between the end of the second war with England and the Civil War. The cotton trade of the South accounted for more than half of total U. S. exports during the period, with rice, sugar and tobacco as subsidiary commodity exports. The value of cotton exports alone increased from \$17.5 million in 1815 to \$191.8 million in 1860. The West enjoyed an expanding trade in wheat and corn and derivatives thereof (pork bacon, lard, flour, whisky) first with the South and then increasingly after the mid 1840's with the Northeast and Europe. However, at this point their similarity ends. Let me point up the contrasts.

1. The South was characterized by its concentrated production for the market of a single export staple with a comparative advantage so great that even in periods of low cotton prices, resources could not receive an equal return from alternative types of economic activity. The West had no overwhelming comparative advantage in a single commodity but rather branched out into mining (lead in Missouri, copper in Michigan and iron at Pittsburgh) and various kinds of processing.

2. Large scale organization typified the southern plantation and a resultant extremely unequal pattern of income distribution reinforced, of course, by the institution of slavery. Wheat and corn in the West could be produced most efficiently on the "family size farm" given early 19th century technology. In consequence the pattern of consumer demand was markedly different. The South was almost totally lacking in urban development during the period (with the exception of New Orleans which served as an entrepôt for western foodstuff for the southern planter and as a port for cotton exports), and its states were conspicuously at the bottom of the list of retail stores per thousand population in the 1840 census. A large percentage of the South's population remained outside the market economy. In contrast small community centers dotted the West to serve the local populace and served as nuclei for residentiary industry and trade and services. While these early developed to serve local consumer needs, with the gradual expansion of the market and the development of external economies many came to serve an increasingly large area and become export industries. With each surge of expansion in the West (1816-18, 1832-39, 1849-57), an increasing percentage of western farmers shifted out of self-sufficiency and became a part of the market economy.

A further consequence of these contrasting structures was the differen-

¹⁸ This very brief account is a summary from two chapters of a study I am completing on U. S. economic growth from 1790-1860. Of necessity the supporting statistical and qualitative evidence cannot be presented in this short paper.

tial investment in education. The South had the highest illiteracy rate (as a percentage of the white population), the lowest ratio of pupils to (white) population, and the smallest number of libraries. Even western states that were just emerging from the pioneer stage were conspicuously higher than the South in educational investment.¹⁹

3. Little additional investment was necessary for the efficient export of southern cotton. Neither transportation development nor extensive subsidiary industry were required. The Factor with his ties with northern credit and shipping served as both the exporter of the planter's cotton, and importer of his foodstuff (from the West) and manufactures (from the Northeast and Europe). Large scale investment in the South was devoted solely to the opening up of new cotton lands and the acquisition of slaves. Extensive investment in transportation (as well as other facilities to implement the export of goods) was essential to opening up the West. Moreover, there were important locational advantages to processing wheat and corn products into flour, corn meal, ham, bacon, salt pork, lard, and whisky within the region rather than without. In consequence a variety of such manufacturing grew up and promoted urban development in the West.

4. The unique characteristics of the ocean freight trade which resulted in one-way cargoes from the cotton ports resulted in back hauls of manufactured goods being imported into the cotton region at very low rates. As a result there was no protection for local consumer oriented industries from the cheap imports of the Northeast and Europe. In contrast manufactures had to come to the West either over land or via the long route back up the Mississippi, and the protection thereby assisted the early development of consumer oriented industries in the West.

Is this purely historical argument with little relevance for the contemporary scene? I think not. The special institution of slavery like the special characteristics of land tenure systems is capable of being examined in terms of economic analysis and we only beg analytical answers by retreating to the institution per se as an explanation.²⁰ The characteristics described above go far to explain the differential success of regional economies in the contemporary world. A positive restatement of the thesis elaborated above is that the development of a successful agricultural export industry will result in an increase in income to the region, and under the favorable conditions outlined above will lead to:

(1) Specialization and division of labor with a widening of the regional market;

¹⁹ For interesting figures on investment in knowledge see H. R. Helper *The Impending Crisis of the South* (New York: A. P. Burdick, 1860), pp. 144, 288-89.

²⁰ See A. H. Conrad and J. A. Meyer, "The Economics of Slavery in the Ante-Bellum South," *The Journal of Political Economy*, Vol. LXVI, No. 2, April 1958.

(2) The growth of facilities and subsidiary industry to efficiently produce and market the export commodity;

(3) The development of residentiary industry to serve local consumers, some of which may, in consequence of expanding markets and external economies developed in association with the export industry, lead to a broadening in the export base;

(4) As a natural consequence of the above conditions, the growth of urban areas and facilities;

(5) An expanded investment in education and research to broaden the region's potential.

Under these circumstances, a good deal of industrial development will occur naturally as a consequence of the conditions described above. Indeed as the regional market increases in size, more and more manufacturing firms will find it feasible to establish branch plants there.

Where the unfavorable conditions outlined above obtain, then there is room for effective governmental policy to modify them. The alteration of land tenure systems (which should not be done at the expense of productivity, however) and the redirection of public expenditure into research, technology, and education promise to yield very handsome returns.²¹

III

Let me point up the differences between the argument advanced in this paper and the two hypotheses of Professors Rostow and Schultz. My argument with Rostow is, I think, the more fundamental. Rostow's thesis is, in effect, the same as one presented at the annual meetings of this Association in 1951 by Professor J. K. Galbraith in a paper entitled "Conditions for Economic Change in Underdeveloped Countries."²² Growth is associated with industrialization and stagnation with agriculture. It is my contention that this misses the whole problem of economic change and reflects a basic misreading of the economic history of the past two centuries.²³ Involvement in the larger market economies, despite the evident hazards entailed, has been the classic way by which regional economies have expanded. It has resulted in specialization, external economies, the development of residentiary industry, and the growth of vertical "dis-integration" as a result of the widening of the market to which Professor Stigler rightly attributes a good deal of the increase of manufacturing productivity.²⁴ I

²¹ See Arnold C. Harberger, "Using the Resources at Hand More Effectively," *Proceedings of the American Economic Association*, May 1959, pp. 134-46.

²² *This Journal, Proceedings*, Nov. 1951, pp. 689-96.

²³ See A. J. Youngson, *Possibilities of Economic Progress* (Cambridge: The University Press, 1959), for evidence from the economic history of four regions to support this argument.

²⁴ Stigler, *op. cit.*, p. 190.

have made clear in the previous section the factors that can prevent successful regional expansion, but it should also be clear that these are not synonymous with agriculture per se.

My quarrel with Professor Schultz is not over the application of his "retardation hypothesis" to the contemporary American Scene, but rather with his contention that economic history strongly supports his argument that economic development has taken place in primarily industrial-urban matrices.²⁵ I don't think that the 19th century economic history of the Midwest from 1815-1860, the Pacific Northwest from 1880-1920, or even California from 1848-1900 (where it was first the impetus of mining and then agriculture) support his argument. There is certainly not the space in this paper to explore the relative shifts in demand and supply, and the income elasticities, which make for the difference of opinion, and indeed it is not necessary at this point since the facts of the matter are that these (and other U. S.) regions grew up, developed urban centers, external economies, and manufacturing in consequence of a successful agricultural export trade. I have no quarrel with Professor Schultz's argument with respect to imperfections in the factor market and the importance of investment in human capital, and indeed I believe that they fit in very well with the argument I made in the previous section of this paper. I would simply argue that a successful agricultural export trade can and has induced urbanization, improvements in the factor markets, and a more effective allocation of investment funds.

In conclusion I should like to restate the positive position that the relevant problems of regional economic development revolve around the issues raised in the main body of this paper. They are not issues of agriculture versus industrialization but rather revolve around a region's ability to become integrated into the larger markets of the world through exports, and of the resultant structure of the regional economy which will influence its ability to achieve sustained growth and a diversified pattern of economic activity.

²⁵ Schultz, *op. cit.*, p. 147.

DISCUSSION: THE LOCATION OF ECONOMIC ACTIVITY

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It is a real pleasure to comment on two papers in which, to adopt Boulding's phrase, "the skills of the economist" are employed with such virtuosity.

Professor Vining has given us a description of the spatial structures of an economic system which has great intuitive appeal. And Professor North has carefully avoided the oversimplifications inherent in the "industrial take off" or other single factor models of economic development to bring us a careful analysis of the historical role of agriculture in the regional economic growth of the American economy.

Both papers illustrate a point which I would like to emphasize—It is time for us, as economists, to quit searching for *a theory*—even a "general theory" of economic development. Rather we should concentrate our effort on the construction of growth or development models which reflect the physical and institutional relationships which characterize particular national and regional economies. This requires, unfortunately, that we take the time, as both North and Vining have done, to become deeply familiar with the history of economic growth and the details of economic structure in the regions or nations for which such models are being developed.

The main burden of the argument presented in North's paper is that "the successful production of agricultural (or indeed most extractive) commodities for sale without the region can be, and under certain conditions has been, the prime influence inducing economic growth." Where technical, economic, and institutional forces have interacted to produce an environment conducive to a favorable distribution of income, the growth of subsidiary industries, and technological advance, rapid economic development has occurred. Where technical and institutional forces have reinforced the dominant position of limited agricultural or extractive industries, as in the old South or certain parts of the inter-mountain area, economic development has been stifled.

North's recognition of the conditions which may intervene between the successful development of agriculture or other extractive industry and continued economic development represents an important modification of his former position. In his article on "Location Theory and Regional Economic Growth" in the June 1955 issue of the *Journal of Political Economy*, North argued that "there is nothing to prevent population and per capita income from growing in a region whose export base is agriculture (p. 257)."

I only wish that North would push this revision of his previous position

one step farther. Such a step would involve the positive assertion that *the emergence of expanding urban industrial centers is essential to the long term growth of population and per capita income levels regardless of the original basis for regional growth*. Such an assertion would remove the major source of inconsistency between North's and Vining's papers.

Recognition that unfavorable conditions may intervene between the development of a highly commercial agriculture producing for an export market and successful regional development also forces recognition of the important role which public policy may play in modifying such unfavorable conditions. Arguments with respect to policy can then be directed to questions of means—to the relative effectiveness of general approaches emphasizing public expenditures on research, technology, and education, in contrast to more direct investment and incentive measures.

It is at this point—in considering the role of public policy as a factor affecting the rate of regional economic development—that I find Professor Vining's approach to location economics and regional economic growth lacking.

Let me repeat a previous point. Vining's description of the spatial structure of the economic system has great intuitive appeal. Of the various models of spatial equilibrium I find that Vining's model, more than any of the others, helps me to understand the spatial structure of the American economy. Unlike the regional input-output models as employed by Isard, Moses, and others, the space factor is brought explicitly into the Vining model. And unlike the linear programming transportation models that have been employed operationally, Vining's model encompasses the entire spatial structure of the economy rather than trade between representative centers through which commodity flows for the entire region are forced to pass.

In spite of my admiration for Vining's model, however, I have finally forced myself to conclude that *its appeal is primarily based on its ability to describe*, in a highly abstract manner, the spatial structure as it is emerging under the influence of equilibrating economic forces, rather than on its operational usefulness in applied economic research.

Nevertheless, my main dissatisfaction with the Vining model is not in terms of operational criteria. Rather it is the fact that the forces leading to a spatial equilibrium in the economic system, as employed by Vining, are all-pervasive. There are no policy or decision variables in Vining's system. The system has been, in my opinion, artificially closed. The spatial structure of the economy is developing under a set of immutable economic forces over which man, either individually or collectively, has no control—and which Vining apparently feels man probably should not tinker with even if he knew how.

I will not here attempt to present a fully developed model of regional economic growth which meets my objection to the Vining model. It does seem to me that any satisfactory model would involve the following components: For any small geographic area and limited time period the model would include a large number of exogeneous variables over which the people living in the area and time period are not capable, either publicly or privately, of exerting any real control, plus a limited number of endogenous variables subject to collective control. The wider the geographic area within the sphere of the public decision-making unit, and the longer the time period involved, the more extensive would be the number of variables over which public control could be exercised, and the smaller would be the number of variables outside the impact of public policy.

If a model of the type I have outlined above is consistent with empirical reality, and work by McDermott and Wallace in southern Indiana implies this, it then has definite implications for development policy and the conduct of the rural development program in particular. The program, as now organized, is asking those public economic units with control over the smallest number of policy variables and subject to the largest number of exogenous forces to lift themselves by their own boot straps from a situation where Professor Vining implies that they belong anyway.

Let me again express my appreciation for two excellent papers.

DISCUSSION: THE LOCATION OF ECONOMIC ACTIVITY

ORIS V. WELLS

Agricultural Marketing Service

"... the almost total obliteration of Malthus's line of approach and the complete domination of Ricardo's for a period of a hundred years has been a disaster to the progress of economics.

"... Ricardo is investigating the theory of the *distribution* of the product in conditions of equilibrium, and Malthus is concerned with what determines the *volume* of output day by day in the real world.

"... Ricardo, in the course of simplifying the many successive stages of his highly abstract argument, departed, necessarily and more than he himself was aware, away from the actual facts; whereas Malthus, by taking up the tale much nearer its conclusion, had a firmer hold on what may be expected to happen in the real world."—John Maynard Keynes, "Robert Malthus: The First of the Cambridge Economists," *Essays and Sketches in Biography*, Meridian Books, New York, 1956.

It is, I know, no longer fashionable to admit that one has ever read, much less enjoyed, the writings of John Maynard Keynes. Yet the development of this program and the two main papers which have been presented

here this afternoon do remind me of Keynes' lament on Malthus vs. Ricardo. That is, what started out to be a discussion of the formal theory of location has gradually developed into a discussion of the problem of economic development or as Dale Hathaway recently said, "One aside is necessary by the way of introduction. Professional interest in recent years has been strongly diverted to the problem of 'economic development.'"

I have no serious argument with this drift. It so happens that I feel the theory of location is in fact much better understood by many laymen and political leaders, and in much more complex detail, than many professional economists realize. Further, the more formal theory of location is all too often either an outline of the historical stages through which agriculture, industry, and commerce passed within the European culture or, alternatively, a simplified description of spatial structure currently existing, whereas I suspect our most immediate interest is in the relation of location theory to the general problem of government assistance or policies affecting resource development.

So, except for one aside, I have no desire to argue with the basic statements of either Vining or North. This one aside has to do with the Schultz statement from which both papers start. I concur in Schultz' statement that economic development occurs in a specific locational matrix, that there may be one or more such matrices in a particular economy, and *most important of all* that "This means that the process of economic growth does not necessarily occur in the same way, at the same time, or at the same rate in different locations." It is true that Schultz follows this with two propositions to the effect that the locational matrices are usually primarily industrial-urban in composition and that the existing economic organization works best at or near the center of a particular matrix of economic development and in those parts of agriculture which are situated favorably in relation to such a center.

But it seems to me that Schultz in the particular context was not arguing that an efficient agriculture is not an essential supporting factor of any successful industrial-urban development. Rather, Schultz at the particular time was indicating that the kind of economic development with which John Stuart Mill and the older English economists were concerned was no longer relevant. Current conditions are such that economic development no longer requires a transfer of capital and labor into farming, with agriculture in a position of advantage because of a rise in the price of food, but rather the reverse. Schultz' real concern was the explanation of unequal rates of development within our economy or, to use his own title, "Divergencies in Economic Development Related to Location."

I of course agree with North that agriculture can make a positive contribution to regional economic development. In fact, I should be inclined

to argue that agriculture plays an even more substantial role than North suggests, with especial emphasis on the efficiency which can come with specialization and division of labor and a widening of the regional, national, or international market.

I also agree with the preliminary materials which I had from Vining. (These were in the form of a statement presented a decade ago before the Interstate Commerce Commission.)

Vining first describes the current spatial structure of economic activity, developing the idea of an economic surface with the relative height of each major industrial or metropolitan complex determined by population density multiplied by some such factor as per capita income. Each of these industrial-urban peaks slopes off into hinterlands of varying sizes, gradually subsiding into the agrarian plains—in fact, one visualizes the New York City complex dominating the American economic scene like Mt. Everest with a scattered series of serrated subsidiary peaks and associated foothills gradually grading down through the better farming sections into Theodore Schultz' forgotten rural areas. But Vining was also arguing that the current economic structure does not lead to the conclusion that there is a secular or long-run contraction in the contribution of the South to the American economy; that the use of adjusted ratios of income and manufacturing output to population for *appropriate economic areas* gives a different picture than one gets from crude ratios calculated from data for *existing political areas*; and that there was in fact a decade ago "clear evidence of relatively rapid economic growth of the South and Southwest."

The fact that Vining was arguing before the Interstate Commerce Commission brings me to the point I mentioned earlier—that is, the relation of governmental activities to regional resource development.

On the one hand, there are many who feel that the government, as a representative of all the people or the public interest generally, is better able to compromise conflicting short-run interests or to consider long-run possibilities and necessities than are most private individuals or business concerns. On the other hand, there are at least some footnotes which suggest that the rigorous logic which we call economic theory no longer applies once government is involved, chiefly because of the likelihood that the maximization of short-run private enterprise profits will be subordinated to other considerations.

The introduction of governmentally determined decisions into the field of resource development does raise some procedural difficulties and does on occasion lead to enough waste or inefficiency to irritate many economists, but in many cases I see no alternative. The problem is not whether government should or should not assist in resource management but is

instead one of seeing that governmental actions are taken on as well informed and as rational a basis as possible.

In general, within a democratic framework such as ours, or for that matter any governmental framework within which the wishes and desires of the people generally are given substantial consideration, we can, I think, usually assume that there will be (a) a great many short-run frictions with respect to problems that have to do with dynamic developments which tend to change the status quo, resulting in one group feeling that the established order of things is being arbitrarily changed while another group feels that obviously desirable changes are being unnecessarily retarded, and (b) that it will be necessary to devote *at least some attention* to resource development in all of the various economic sectors and geographic regions of the country, which still in no way diminishes the need for seeing that the *differential rates* at which assistance is applied are in accord with the best available judgment.

Perhaps this means that the chances of moving ahead are on the whole best with respect to the development of new resources or reacting to some of the more difficult major problems which may for one reason or another especially catch public attention—as, for example, the conservation movement or the currently increasing interest in slum clearance and downtown redevelopment.

In any event, this whole question of the location of economic activity and its relation to economic development is not only theoretically fascinating, it is also of great practical importance. Within the United States it relates to the problems of maintaining an expanding economy with as few cyclical downswings as possible, as well as the longer-run necessity for conserving and developing our resources in such a way as to support over the indefinite future a far larger population than we now have.

Meanwhile, questions as to the policies most likely to maximize agriculture's contribution to economic development are even more important today in the so-called "underdeveloped" countries than in the United States. In this connection, it occurs to me that there may be an interest in the leading lines of an argument relating to the place of the F³ complex—farms, forestry, and fisheries—in national development programs which was advanced in a document prepared for the last FAO Conference by the economic group in the Food and Agriculture Organization.

Basically, the FAO argument assumes that all countries—particularly the underdeveloped ones—are short of some resources, and in nearly all cases of funds to spend on government services and to invest in capital improvements and suggests that:

- (1) "Because so many of the issues lie outside the field of agriculture, and involve questions of balance between agriculture and other phases of the

economy, and agricultural program-making might best be carried forward if a country is planning other parts of its economic development at the same time."

- (2) Individual projects will have to be selected for their contribution to balanced rural-urban development, judged "on the basis of objective cost and benefit appraisals." Projects can be selected that promise to return the most real income for the "costs involved . . . projects which, in terms of economic theory, have the highest marginal returns for the scarce resources utilized."
- (3) Finally, many essential early projects to aid economic development will provide the necessary "facilities which are essential for both rural and urban development." Such "infrastructure" projects and investment, in such fields as communications, transportation, education and research, irrigation and hydro-electric dams, etc., "provide the essential conditions without which any type of advanced system cannot exist."

This is not the time or place to comment at length upon these basic principles of the FAO argument. But I do call attention to the fact that development of the so-called "infrastructure" which makes possible the expansion of rural and urban activities necessarily has a substantial effect on both the location of economic activity and the process we call economic development. Perhaps the term "infrastructure" is relatively new, but the idea is one which fortunately the American people and their government seem to have so far handled very well.

INTERREGIONAL COMPETITION IN AGRICULTURE

Chairman: Leland G. Allbaugh, Tennessee Valley Authority

PRINCIPAL FORCES, NORMATIVE MODELS, AND REALITY

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Introduction

ONE could say that demand and supply are the determinants of the economics of interregional competition in agriculture. As with most general statements, it would be a valid proposition, but of little practical value. Much more detail about the multiple components of these two forces would be required before an operationally useable structure could be developed for study and appraisal purposes. The basic framework must be constructed in the space, form, and time dimensions with meaningful criteria underlying the decisions of the human agents involved. The construction of theoretical economic models must compromise between a meaningful degree of realistic detail and the unmanageable quantification problem resulting with increasing complexity. This places a major burden on the research worker—the selection of the most significant components for inclusion in his formulation. A large amount of oversimplification is inevitable.

Three basic realities condition the economics of agriculture as we know it. *First*, the final demands of man for food and non-food biological products. These demands have significant time, form, and location intensities that are not necessarily oriented toward ease of satisfaction by the supply potential. *Second*, all significant final products of agriculture are derived from plant life tied to immobile land sites. This fact rests on comparative costs, not technological barriers. Man can alter to some extent the range and capacity of land to produce plant growth, but location and general climatic aspects are unalterable. Consequently, particular sites have a limited range of feasible plant types. *Third*, institutional organizations and physical techniques exist for resource and product conversions, for transporting resources and products between geographical locations, and for storing materials through time. The location of livestock activity involves economic forces of essentially the same type that impinge on any conversion activity. Livestock should be considered as mobile, living, processing factories using plant products as raw material. Some store the converted product over the limited period of their economic existence and others provide a rather continuous stream of converted output (such as milk or eggs) until the "factory" simultaneously reaches the end of its economic and natural life and is marketed as salvage.

The major factors underlying the structure of production and marketing have been indicated. Economists are interested in the details of the *efficient* structure which these factors *should* determine. Consequently, the following quantitative elements are essential data:

1. Specification of the demand forces as functions of value indicators (prices), in space, time, and form dimensions.
2. Physical conversion factors and unit conversion costs for all feasible transformations.
3. Transportation costs per unit of mobile material for all feasible pairs of locations.
4. Storage costs per unit of material as a function of time.
5. The location and quantitative capabilities of land units.
6. Institutional and physical restrictions under which individual firms operate (both short and long-run).
7. Risk and uncertainty factors and their impact on decision making through restrictions on the profit maximization motive.

Before outlining a sequence of formal models that could be used for efficiency studies of interregional competition, we should discuss the general nature of analytic economic models. From my viewpoint, two clear classes exist, namely, (1) efficiency models and (2) descriptive-predictive models. Efficiency models use basic physical relationships and specified economic parameters to determine what *should* result from specified initial conditions. The economic specifications may or may not be the purely competitive form. Interest lies in contrasting what should or could happen with what did or might happen.

In contrast, descriptive-predictive models (even of the so-called structural type) specify interdependent functional relationships and employ realized data for estimating the specified parameters. Their utility lies in average description of the way the structure did operate or might operate into the future—provided stability of interactions can be assumed or expected. No direct concept of efficiency is involved. These models do have important practical applications and are significant areas of pursuit. Nevertheless, efficiency model analyses are on a higher plane of significance—being diagnostic or active instead of passive appraisers of economic systems.

Some Formal Interregional Models

A series of skeletonized, conditional, interregional models will now be developed, leading toward a reasonably complete model. These models are efficiency types based on purely competitive specifications. They are all linear in form and discrete in structure so that programming solutions are simplified. The objective is to formalize the logical structure of the systems and not to provide any case studies or become involved in data availability or computing problems. Conditions of certainty are assumed and considera-

tion of stochastic properties surrounding restrictions, input-output coefficients, or other risk elements is delayed to a later point. The latter are vital realities and should be a part of most analytic models designed for applied research. Finally, interest charges and price discounting are omitted, but can be included by the researcher in actual studies.

Space model (single homogeneous product)

Given: n supply-demand points

t_{ij} = unit transportation costs (minimal) between points i and j , with $i, j = 1, 2, \dots, n$ and $t_{ii} \geq 0$

$D_i^0 = a_i + b_i P_i$, demand function at point i

$S_i^0 = c_i + d_i P_i'$, supply function at point i

P_i = price at point i at demand level

P_i' = price at point i at supply level

To determine: $P_i, P_i', X_{ij} \geq 0$ for $i, j = 1, 2, \dots, n$, where X_{ij} is the amount transferred between points i and j , such that; for

$$X_{ij} > 0, \quad P_j - P_i' = t_{ij}$$

$$X_{ij} = 0, \quad P_j - P_i' \leq t_{ij}$$

and

$$\sum_i \sum_j X_{ij} = \sum_i D_i^0 = \sum_i S_i^0$$

This model is the simple, spatial model that has been in vogue for programmers in recent years. The direct solution would be tedious. It can be shown that the problem is equivalent to the linear program and dual that minimizes transportation costs and maximizes competitive value under the restrictions of the given data and the equilibrium specifications. Consequently, the solution can be secured by programming techniques.¹

Space-time model (single homogeneous product)

Given: n supply-demand points

$M > 2m$ time point subdivisions (usually, problems can be solved as separate sequences of m time periods after first free market period is located)

t_{ijt} = unit transport cost between spatial points i and j at time point t (may be constant for all t)

$s_{it'}$ = unit storage cost between time points t and t' at spatial point i (may be constant for all i)

¹ See Judge, G. G. and Wallace, T. D., "Estimation of Spatial Price Equilibrium Models," *J. Farm Econ.*, Vol. XL, p. 801 (Nov. 1958), for a discussion of the iterative computing process and references to prior literature on spatial equilibrium models.

$C_{ij}^{(h)} = t_{iht} + s_{tt'h} + t_{hjt'}$, minimal combined space-time unit transfer cost

between point i at time t and point j at time t' , with (h) indicating the storage location (when $t=t'$, (h) becomes meaningless)

$D_{it}^0 = a_{it} + b_{it}P_{it}$, demand function at point i at time t

$S_{it}^0 = c_{it} + d_{it}P'_{it}$, supply function at point i at time t

To determine: $P_{it}, P'_{it}, X_{ij}, X_{ij}^{(h)} \geq 0$ (where X_{ij} is a direct transfer for

current demand, $X_{ij}^{(h)}$ is a deferred transfer for later de-

mand) such that, for

$$X_{ij} > 0, \quad P_{jt} - P'_{it} = t_{ijt}$$

$$X_{ij} = 0, \quad P_{jt} - P'_{it} \leq t_{ijt}$$

$$X_{ij}^{(h)} > 0, \quad P_{jt'} - P'_{it} = C_{ij}^{(h)}$$

$$X_{ij}^{(h)} = 0, \quad P_{jt'} - P'_{it} \leq C_{ij}^{(h)}$$

and

$$\sum_i \sum_j \sum_t \sum_{t'} (X_{ij} + X_{ij}^{(h)}) = \sum_i \sum_t D_{it}^0 = \sum_i \sum_t S_{it}^0$$

It is obvious that this model is similar to the previous model with respect to computational difficulties. However, the temporal pattern of spatial prices and transferred quantities is brought out in detail. There are certain aspects of the model, due to the introduction of time, that should be clarified. The model is intended for application to those cases in which all deferred shipments are cleared in a closed sequence of point time periods—usually a sequence of one year in length. This implies that one or more time periods should exist near the beginning of the relatively surplus periods during which deferred transfers are not economically feasible and all spatial transfers are current. The price level must be depressed low enough so that storage costs can be covered by subsequent price levels at destination points. At the end of the sequence, after all deferred transfers have been made, the free market periods should occur again. It is essential that one locate these sequences, because the market clearing requirement must be met and the initial period in the study (and all thereafter) should be free of deferred

transfers out of past periods not included in the analysis.

Time is a uniformly continuous variable and the injustice of using discrete time period decomposition for programming purposes is much more serious than comparable treatment of the spatial dimension. It behooves one to choose reasonably short subdivisions so as not to cover up through aggregation the essential free market periods. Actual storage costs might take the form $s_{it'i} = e + f(t' - t)$, where e is a fixed charge covering entry and exit costs and f is a variable charge per unit of time. If this be the case and $e \neq 0$, then another free market period would be found between the last period for "into-storage" activity and the first "out-of-storage" period.²

While discussing the time variable, a final point must be included. Careless consideration of demand and supply as functions of specified time periods leads to potential confusion about whether case studies are operating with rate (or flow) or stock concepts. More care should be taken when rate type concepts employ a time basis of much longer duration than is compatible with the activity under consideration.

Space-time-form model (single homogeneous raw material convertible to homogeneous products—no by-products)

Given: n supply-demand points

$M > 2m$ time periods (need only m)

1 = raw material (may also be one of the products)

r = products with conversion factors a_k , $k = 1, 2, \dots, r$

T_{ijt} = unit raw material transport cost between points i and j at time t

t_{ijk} = unit transport cost between points i and j at time t for product k

$s_{it'ik}$ = unit storage cost between time points t and t' at point i for product k

$T_{ijk} = a_k t_{ijk}$, unit raw-equivalent transport cost

$S_{it'ik} = a_k s_{it'ik}$, unit raw-equivalent storage cost

$S_{it'i}$ = unit raw material storage cost between time points t and t' at point i

r_{ik} = unit processing cost (excluding raw material cost) at point i and time t per unit of product k

$R_{itk} = a_k r_{ik}$, unit raw equivalent processing cost

$C_{ijk}^{(a)} = T_{ijt} + R_{itk} + T_{ojtk}$, minimal space-form transfer cost per unit of raw equivalent between points i and j at time t for product

² This same "break period" to cover fixed charges is found in spatial problems when $t_{ij} = e + fd_{ij}$ and the spatial points are closely spaced with a unidirectional graduation from surplus to deficit. Practical studies that estimate rates as functions of distance err if the constant term is not included.

k with superscript (g) denoting the processing point

$$C_{i j k}^{(f)(g)(h)} = T_{ijf} + S_{it'f} + T_{fgv} + R_{gvk} + T_{gjk} \text{ (minimal) or } T_{igt} + R_{gtk} + T_{ghk}$$

+ $S_{it'hk} + T_{hjt'k}$ (minimal), whichever is smaller, and representing the minimal combined space-time-form transfer cost per unit of raw equivalent between point i at time t and point j at time t' for product form k , with superscript (f) denoting the storage point for raw material, (g) denoting the processing point, and (h) the storage point for the product (only (f) or (h) would hold for a given product)

$$d_{ik}^0 = a_{ik}^* + \sum_q b_{itq}^* P_{itq}^*, \text{ demand function for product } k \text{ at point } i \text{ at}$$

time t , assuming possible interdependencies

$$D_{ik}^0 = d_{ik}^0 / a_k = a_{ik} + \sum_q b_{itq} P_{itq}, \text{ raw-equivalent demand at con-}$$

sumer level, with $P_{itq} = a_q P_{itq}^*$

$$S_{it}^0 = c_{it} + d_{it} P_{it}, \text{ raw material supply function at plant entry at point } i \text{ at time } t$$

To determine: $P_{itk}^*, P'_{it}, X_{ij k}^{(g)}, X_{ij k}^{(f)(g)(h)} \geq 0$ (where $X_{ij k}^{(g)}$ is a direct trans-

fer for current demand and $X_{ij k}^{(f)(g)(h)}$ is a deferred transfer for

later demand, both in terms of raw equivalent) such that; for

$$\begin{aligned} X_{ij k}^{(g)} &> 0, & P_{jtk} - P'_{it} &= C_{ij k}^{(g)} \\ X_{ij k}^{(g)} &= 0, & P_{jtk} - P'_{it} &\leq C_{ij k}^{(g)} \\ X_{ij k}^{(f)(g)(h)} &> 0, & P_{jtk} - P'_{it} &= C_{ij k}^{(f)(g)(h)} \\ X_{ij k}^{(f)(g)(h)} &= 0, & P_{jtk} - P'_{it} &\leq C_{ij k}^{(f)(g)(h)} \end{aligned}$$

and

$$\sum_i \sum_j \sum_t \sum_{t'} \sum_k (X_{ij k}^{(g)} + X_{ij k}^{(f)(g)(h)}) = \sum_i \sum_t \sum_k D_{ik}^0 = \sum_i \sum_t S_{it}^0$$

Again, this model is merely a mild extension and results in the same mathematical problem as before. The introduction of by-products should not complicate the basic nature of the solution. When the X 's and P 's have been determined in terms of raw equivalent, they can be converted into their product form quantities.

Space does not permit the continuation of outlining in detail the partial models that I have in mind. To give the reader some insight into this integrated sequence (for his own development) a sketch follows:

1. Single product space model (first case given)
2. Single product space-time model (second case given)
3. Single raw material, multi-product, space-time-form model (third case given)
4. Multi-raw-material, single product, space-time-form model
5. A combination of 3 and 4 (includes 1 and 2)
6. A combination of 5 and a new sector to explain the supply functions used in 5
7. The reformulation of 6 to include the risk and uncertainty factor both at the farm and marketing levels

Some explanation of items 6 and 7 is warranted. When item 5 had been expanded across all relevant products and raw materials, we would have the marketing sector model (including the livestock mixture at the farm locale integrated or not with plant production activities). Two basic ingredients of this model are the demand functions for products and the supply functions for raw materials. Up to this point both of these have been unexplained. Since the specification of a consumer objective function is foolhardy and input-output coefficients are equally vague, programming to secure the demand structure is not feasible. Assuming these demand forces are autonomous, it is not destructive to the efficiency content of the model to employ our best descriptive-predictive estimates from time series and/or cross-sectional data. It will be assumed that this can be done and that linear approximations can be stated for conditions near the equilibrium point.

What about the farm supply functions? For an efficiency model of inter-regional competition, we should use programming of micro-units and aggregate them for point supply functions. It is not legitimate to imply efficiency at the farm level, when we are interested in its analysis, by employing time series data and aggregative descriptive-predictive models for developing the supply functions. This does not mean that micro-programming and multi-price mapping of every farm unit is necessary. Useful approximations could be made by grouping into "homogeneous" sets and making a scalar expansion of the micro-program for a representative unit of each set. The bases of placing units into different sets in a given area would involve size, land capability, and other significant resource restric-

tions in the short-run. Long-run analyses would require specifying the relationships connecting the micro-economic results with the dynamic structure of the units and the gradual erosion of flexible restrictions.

All that has been developed to this point has been based on a perfect knowledge, certainty environment. Its utility would be limited in appraisal. Frequently, allusions have been made to risk and uncertainty restrictions in the real world, due primarily to the time dimension. *Ex ante* planning models must contain these components and practical *ex post* appraisal of the real system cannot rest on hindsight certainty.

Many economists try to impress others of the Jekyll and Hyde differences between risk and uncertainty when a more rational picture would be Narcissus and his slightly rippled image. Most issues such as future price can be converted from an uncertainty item to a risk item by more effective predictive models. What might be uncertainty to an individual may be a risk issue to a group. The position will be taken that risk factors are most numerous and bear on decisions more actively than the uncertainty paths of the future.

Numerous risk factors bear on the farm enterprise decision-making problem. Many of the short-run resource restrictions are "rubbery" and, therefore, essentially random variables. Weather, insect, and disease forces cause marked variation in realized input-output coefficients. Some of this seemingly unpredictable variation might be removed by appraising past paths by Markov process analyses. Costs of variable inputs and prices for future output are predictable with possible error so that the actual coefficients of the objective function are random variables.

Aside from the fixed investment risks of marketing firms, price risks are certainly involved on storage operations. If regular costs were similar at all locations, risk would be lessened by storing the product in the surplus instead of the deficit region. This would reduce the impact of potential overstorage. Other risk factors in the form and space dimensions impinge on marketing firms.

Treatment of these stochastic properties of enterprise programming has been sparse and occasionally misdirected thus far. Special difficulties exist when restrictions or input-output coefficients are involved. When price risks are the only consideration, the solution is reasonably clear in abstract form. Rational entrepreneurs, depending on their resource equity and liquidity position, are worried about employing practices that jeopardize the solvency of the organization. Consequently they separate alternatives on a dual basis, namely, "too risky" and "acceptable." Under the profit maximization drive, that acceptable alternative providing maximum expected returns (irrespective of the variance magnitude, as long as it does not refute the acceptability classification) is the optimum program. Since risk

cannot be eliminated completely, the decision would be based on maximizing

$$E(Z) = E \sum_i c_i x_i$$

subject to regular restrictions and $P(Z < -k) \leq \alpha$, where $-k$ would be a tolerable loss value and α would be a small, acceptable probability level. Application requires information on $\sigma_{c_i}^2$ and $\rho_{c_i c_j}$. If the ρ -values are all +1 or a consistent combination of +1 and -1 values, the risk restriction can be entered linearly into the program. Otherwise, solutions are not so easily found. Further discussion of this subject must be omitted, but ways should be found to transform all stochastic properties into the objective function (by approximation techniques if necessary) so that through the risk aversion function they become active restrictions on the feasible programs.

Only programming models have been covered. Ease of organizing the systems and computability were the major reasons for this choice. Other formulations might employ continuous functions or mixtures. Overlooked were numerous simple "pricing efficiency" models underlying relative price structures in limited space, form, and time contexts. Such models would ignore levels of quantities and prices and merely contain the price differential requirements, assuming the mere existence of the quantity movements. These simple models for localized application are of great practical value, because of the possibility of numerous applications. Price relationships between pairs of markets, between products coming from a given raw material, over storage periods, and between raw materials with common usages are involved.

Research Application and Appraisal

Numerous points of view are admissible for applied efficiency research of industry-wide scope. The major types of problems would fall under the following two headings:

1. Period by period comparisons—both *ex ante* and *ex post*—of what the system (or a part of it) did and what it should have done. The model specification should conform as nearly as possible with the actual environmental conditions. Certain organizational appraisals of the efficient location of processing and distribution facilities could be made by using the results from synthetic plant cost studies at new sites. This would extend the appraisal beyond the acceptance of the short-run, given, market facilities, and lead one into long-run considerations.
2. Estimation of the detailed results if certain arbitrary changes in the economic specifications of the system were made. These results would provide a partial basis for appraising policies about major institutional

or technological modifications. Research appraisal or inferences drawn from the second category are unique to the problems at hand. The results are an essential, logical portion of a broader base of information to aid in reaching a decision. Some of this "what could be" research is vitally needed.

Results of studies falling into the first category are more easily interpreted. *Continuous* bias between actual data and model results for some of the price and quantity categories indicates inconsistencies. Sometimes legitimate improvement of the model specifications will produce consistency. On other occasions a segment of inefficiency will remain unexplainable—indicative of imperfect knowledge or outright institutional restrictions. In either case the researcher should be able to ascertain the cause and suggest remedial action.

In the absence of major continuous bias, one might be alarmed at the "random" variation of the realized data around the postulated results. The model, as an oversimplification of the real structure, could be partly responsible. Actual, random inefficiency under imperfect knowledge could also contribute to the deviations. One should expect a reasonable amount of the latter to prevail, since the inertia of decisions in production and marketing frequently require a sizeable, incentive deviation to promote a corrective change in direction. How much of these deviations is operationally acceptable is very difficult to determine. The decision must rest on the good judgment of the appraiser and some cost estimates of changes in micro-decisions.

Perhaps these notes will inspire a few economists along the analytic paths outlined. It is the higher road—both in personal and in social utility. It is also a rough road, lined with many conceptual boulders. These aspects should be a challenge to the serious economist. We have too many economic "artists," who "know" what is right and wrong about economic structures without analyses or facts. Formalized analyses should not be dismissed as being impossible because of complexity—at least not until more serious effort has been extended.

FARM BUDGETING AND LONG-RUN SUPPLY CURVES

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MY INTEREST in interregional competition lies in the area of long-run supply responses. It is in this area that we come to grips with the interregional problem of most enduring significance.

It is the long-run adjustments in farming, the long-run commitments of resources, the long-run hostages to fortune that cause people to take the greatest interest in interregional competition.

Theory and Method

Approaches to economic analysis stand on two levels. First is the level of economic theory, the general framework used to visualize and to understand the problem as a whole. Second is the working level of specific methods and techniques.

Neither theory nor method can be laid down in tight prescriptions. Economic theory is a way of thinking and it must be continually adjusted to new conditions. Research methods, too, need to be reshaped to fit each problem just as machine-tool makers design new dies and forms for each new machine. The real task is to build the tools to fit the problems as they arise.

Theoretical Framework

Let us begin with theory. The framework that some of us developed a few years ago in the USDA-Harvard interregional competition studies was constructed in terms of the principle of comparative advantage. The present theory of comparative advantage did not arise all at once; it evolved through at least four stages or cultural generations of economists.¹

The first stage is represented by Adam Smith. Smith developed the simple but useful principle of specialization. This can be expressed for either persons or areas. As applied to areas, the principle states that: Each area tends to produce only a few things and to sell its surplus of these and with the proceeds buy the other things it needs. When it is applied to persons, it is often called the principle of the division of labor. Adam Smith called it that in his classic description of a pin factory in chapter I, book I of the *Wealth of Nations* (1776).

The gains of specialization by areas were attributed to differences in natural resources and to the advantages of concentration on one or a few commodities. This was a good beginning.

¹ Ronald L. Mighell and John D. Black, *Interregional Competition in Agriculture*. Harvard University Press, Cambridge, 1951.

Leading figures in the second stage were David Ricardo with his *Principles of Political Economy and Taxation* (1817) and John Stuart Mill with his *Principles of Political Economy* (1848). This group of economists developed an explanation for regional specialization that was the first to be called the principle of comparative advantage. This principle states that: Each area tends to produce those products for which its ratio of advantage is greatest as compared with other areas, or its disadvantage least. This formulation brings in the idea of a two-way comparison. Advantages are compared between alternatives within an area and between areas.

The third stage developed so-called location theory to explain the influence of transportation and transfer costs. The name of Von Thünen, who wrote *The Isolated State* between 1826 and 1863, is associated with the early development of location theory. Much later Alfred Weber made an even more fundamental contribution. Location theory is helpful in understanding why bulky and perishable products tend to have an advantage near population centers. Recent work with spatial models has done much to enlarge the sphere of location theory.

The fourth stage in the evolution of comparative advantage brought demand aspects more definitely into the framework. Alfred Marshall's *Principles of Economics* (1890) made this step inevitable. Bertil Ohlin's *Interregional and International Trade* (1935) contains one of the more adequate statements of a "mutual interdependence" theory of interregional competition in which comparative advantage depends on an equilibrium of supply and demand forces. This is a moving dynamic equilibrium.

Wassily Leontief's *The Structure of the American Economy* (1941) represents a further enrichment of the theory of equilibrium economics with significant interregional applications. Leontief subdivides the relationships in general equilibrium theory into two sets that he terms internal and external. The internal relationships are those that involve the conscious behavior of individual entrepreneurs as they manage their own businesses. The external relationships are those that exist between all the various sectors of the national economy in terms of outputs and inputs for each and every kind of goods and services. His special contribution is in the elaboration of this theory of external interdependence.

This brings us to what amounts to a fifth stage, that of expansion in the time dimension. The first four stages, like the general body of conventional economic theory, are cast largely in the static mold. Alfred Marshall's treatment of time foreshadowed much of what is needed for economic projection, but from Marshall to Leontief, little was done to follow through with a true dynamic theory.

In some fields of science, projections can be made directly from relatively static models. For example, tables of tides, or eclipses of the moon

can be predicted accurately for many years ahead. This cannot be done so readily in economic affairs because the basic conditions underlying supply and demand keep changing. The outstanding economic phenomenon of the current era has been the rapid growth of new technology and its application.

Analytical Methods and Techniques

Let us now turn to the second level, that of methods and techniques. Each of the five stages of theory, just indicated, has a counterpart in method. But because methods deal usually with specific problems, the stages are blended in various proportions. The specific problem that faces the researcher in dealing with long-run interregional competition is how to estimate the probable output of a particular commodity for a specific time or period in the future in each of a number of competing areas.

The Method of Trends

The simplest method of trying to estimate future output in competing regions is to begin by plotting historical trends in production and trends in principal related factors. If one can account fairly well for past trends, it may be possible to estimate for some distance ahead on the basis of qualitative reasoning. This does not mean that one can just extend a statistical line, but rather that a careful appraisal of causal relationships may make it possible to form useful forward estimates.

The trends method may be especially appropriate in a situation with long-term investments such as one encounters in tree fruits. Citrus trees, for example, have a life cycle that extends to 90 years or more. Future production can be projected with some assurance on an actuarial basis not unlike that used by population experts in projecting human population.² Some of the same difficulties in estimating future births and deaths arise. But there are also other factors to consider. New plantings and the elimination of unprofitable orchards are more subject to control than is human population. Total output may be affected greatly by management and cultural practices and these respond to changes in technology and to changes in economic conditions.

Both new and old commodities that are affected sharply by new technology offer unusual difficulties in appraising comparative advantage. Two instances may serve to illustrate—soybeans and commercial broilers.

²Wendell T. Calhoun, Mary Montgomery, and Marion Clawson, "Potential Supply of Citrus Fruits," *Readjustments in Processing and Marketing Citrus Fruits*. Processed. U. S. Dept. Agr. (Washington 1946). pp. 3-32. An earlier use of this method was in the study by Marion Clawson, Carl P. Heisig, and Edgar. B. Hurd, "Long-Term Forecasting of Fruit and Nut Production," *J. Farm Econ.*, October, 1941.

In a postwar study of the competitive position of oil crops in American farming, we made some forward judgment projections.³ These projections were based on an intensive study of historical trends; we also made use of the combined judgments of experiment station committees which appeared in several earlier production adjustment studies.

As events unfolded, soybeans underwent a further remarkable expansion and our projected estimates proved to be altogether too low. Production of soybeans in 1955 was about double our projection. The big unknown was the expansion of soybeans into new areas, especially those north and west of older areas, as a result of the development of new, locally adapted varieties.

Total national production of commercial broilers has increased more than fourfold in the last decade. Entirely new areas of production have entered the picture of interregional competition. Perhaps no method of research projection would have given results very close to the mark.

Even though many historical studies stop short at the point of projection, clear understanding of past relationships can be a powerful tool for qualitative consideration of the future. Einar Jensen's definitive study of Danish Agriculture, for example, is such an analysis for a nation competing in international trade.⁴ Jensen made effective use of budgets for a representative Danish farm to illustrate trends in production from 1871 to 1929. This use of farm budgeting served mainly to summarize important changes in farm technology and farm practices and their effect on output. Detailed analysis showed that changes in methods of production on the representative Danish farm were accounted for by constant striving toward the most profitable utilization of available factors of production. But there was evidence of lag in adjustment to new technology and economic factors.

Statistical Methods

Statistical studies of farmers' supply response were pursued during the 1920's with correlation analysis. The work of H. L. Moore is generally recognized as a starting point.⁵ Others in the universities and in the U. S. Department of Agriculture followed his pathway. These were studies of relatively short-term responses with limited usefulness to long-term in-

³ Peter L. Hansen and Ronald L. Michell, *Oil Crops in American Farming*, U. S. Dept. Agr. Tech. Bul. No. 940, Nov. 1947. See also Edwin G. Strand, *Soybeans in American Farming*, U. S. Dept. Agr. Tech. Bul. No. 966, Nov. 1948.

⁴ Einar Jensen, *Danish Agriculture, Its Economic Development*, J. H. Schultz Forlag, Copenhagen, 1937.

⁵ H. L. Moore, *Forecasting the Yield and Price of Cotton*, Macmillan Co., New York, 1917.

terregional competition research. The application of formal correlation methods to the measurement of long-run responses has offered little promise because usually too few observations are available. The short-run changes also tend to eclipse the longer-run changes that do occur.

Recent work by Nerlove and others with distributed lags and the so-called decay curve may offer some new insight into the problem of disentangling the short- and long-run aspects of historical supply analysis.⁶ This approach may reduce considerably the zone of uncertainty that has surrounded the question of long-run supply response to prices. It may also help in the measurement of some other continuing forces. Nevertheless, there appears to be no escape from the conclusion that the direct projection possibilities from any type of historical analysis are limited mainly to the relatively short-run. Each actual long-run response is largely the result of an irreversible episode. The real value of such studies for long-run response analysis lies in the increased qualitative understanding and the greater ability acquired to exercise judgment about future events.

Linear Programming and Spatial Models

The linear programming technique offers assistance in a number of ways that are helpful in interregional competition studies. The most obvious application in connection with the budgeting method of constructing supply curves is to take over some of the hard labor of repetitive budgeting. In situations that require comparison of many alternative combinations to arrive at a most profitable farm plan, linear programming can take up a significant part of the burden.

Linear programming has been applied also to interregional spatial, or transportation, models. Decided progress along this line has been made in the last few years. In fact, this was one of the earliest uses of linear programming by George Dantzig, the pioneer in this field.⁷ Judge,⁸ Snodgrass,⁹ Henry,¹⁰ and others have made significant agricultural applications.

A primary objective in these studies has been to find the distribution of shipments between surplus and deficit regions that minimizes transportation costs. The contribution to long-run interregional competition has

⁶Marc Nerlove, *The Dynamics of Supply*, Johns Hopkins Press, Baltimore, 1958.

⁷George B. Dantzig, "Application of the Simplex Method to a Transportation Problem" in *Activity Analysis of Production and Allocation*. T. C. Koopmans (Ed.), John Wiley & Sons, Inc., New York, 1951.

⁸George G. Judge, *Competitive Position of the Connecticut Poultry Industry—A Spatial Equilibrium Model for Eggs*. Storrs Agr. Expt. Sta. Curt. 318, 1956.

⁹Milton M. Snodgrass and Charles E. French, "Simplified Representation of 'Transportation Problem Procedure' in Linear Programming," *J. Farm Econ.*, Feb. 1957.

¹⁰William R. Henry and Charles E. Bishop, *North Carolina Broilers in Interregional Competition*, A. E. Inf. Series No. 56, N. C. State College, Feb. 1957.

been chiefly in clarifying the influence of differences in transportation costs on comparative advantage.

Some spatial models have been designed to go further and take account of production and other costs. For example, Snodgrass and French¹¹ tried this enlarged attack with a dairy problem, and Egbert¹² has recently analyzed the optimum regional production location for feed wheat, food wheat, and feed grain for 101 regions in the United States.

Often, the assumptions used narrow the field of inquiry in these spatial studies. But the resulting analysis may contribute substantially to limited phases of long-run supply response, which can then be incorporated in a more comprehensive approach.

Spatial models that bring in farm production costs run into a serious problem of evaluating opportunity costs for non-cash items. Although perhaps technically capable of solution, the requisite models are very complicated. They involve the same problem of imputation that has been such a stumbling block in farm cost studies and which led to the invention and use of farm budgeting. Taking account of changes in technological coefficients in spatial models also presents difficulties but some progress has been made. For example, Isard and Schooler in a recent study of industrial location for the production of synthetic fibers use a very exhaustive model that includes a number of alternative technological processes for eight different fibers.¹³ The total model involves the use of both linear programming and conventional budgeting methods.

Farm Budgeting and Supply and Demand Curves

The use of synthetic supply and demand curves as an apparatus for analyzing comparative advantage in agriculture was suggested by John D. Black in a research handbook in 1932.¹⁴

The supply and demand curves that were wanted for this type of analysis were not short-time or instantaneous curves, such as those that characterize a marketplace, but long-time. The influence of time (and factors associated with time) on supply and demand was pretty well suggested by Alfred Marshall but was not spelled out in detail until later. Cassels, for example, describes the fan-shaped sheaf of demand curves (or supply curves) that can be used to represent curves appropriate to different pe-

¹¹ Milton M. Snodgrass and Charles E. French, cited earlier.

¹² A. C. Egbert, "Regional Adjustments in Resource Use for Grain Production," (Unpublished manuscript, reporting a cooperative USDA-Iowa study).

¹³ Walter Isard and Eugene Schooler, *Regional Economics and Industrial Location*, Papers and Proceedings of the Annual Meeting of the Regional Science Association for 1958.

¹⁴ John D. Black, *Research in Farm Management, Scope and Method*, Social Science Research Council, Bulletin No. 13, June 1932, pp. 87-101.

riods of time.¹⁵ Possible ways of constructing long-run curves are suggested in two articles by Mighell and Allen.¹⁶

The first extensive attempt to construct such curves was in the study of interregional competition in dairying conducted jointly by USDA, Harvard, and several State agricultural experiment stations.¹⁷

This project attempted to measure the competition between New England and the Lake States as broad dairy regions. A number of specific areas in each region were selected for study and farms in a sample from each area were used as a basis for projected 10-year farm budgets. Many trial budgets were constructed and compared for alternative farm organization to determine most profitable and most likely combinations and outputs a decade ahead.

Supply curves based on three points were constructed by assuming three alternative levels of milk prices (relative to other prices) and budgeting each sample farm separately for each price situation. Numerous alternative organizations and partial alternatives were considered for each farm.

Many problems arose in the construction of these budgets, and a number of simplifying assumptions had to be made. Production results from individual farm budgets were then combined to form area and regional milk supply curves. This was not just an additive process, because other factors that were not amenable to analysis for individual farms had to be taken into account. For example, farm abandonment in New England was handled separately. This is the general problem sometimes referred to as the difference between the response of the industry and the response of the individual firm. It is what Leontief had in mind when he divided equilibrium theory into internal and external relationships. The approach through budgeting may come close to the aggregate response sought if sampling methods are well designed and if enough sets of assumptions are devised for encompassing major response possibilities. The external equilibrium approach, while apparently more satisfactory in the short run, soon runs into the inverse problem of adjusting for the internal technological changes. In fact, any approach to the future is faced with the problem in some form.

Later, there came an opportunity to check the production projections against the actual changes over the 10-year period 1936-46, for which the projections had been made. Actual price conditions were near one of the

¹⁵ John M. Cassels, "The Nature of Statistical Supply Curves," *J. Farm Econ.*, April 1933.

¹⁶ R. L. Mighell and R. H. Allen, "Demand Schedules—'Normal' and 'Instantaneous,'" *J. Farm Econ.*, August, 1939, and R. L. Mighell and R. H. Allen, "Supply Schedules 'Long-Time' and 'Short-Time,'" *J. Farm Econ.*, August, 1940.

¹⁷ See Mighell and Black, *Interregional Competition in Agriculture*, cited earlier.

assumptions made, and the agreement between projections and actual outcome was reasonably good despite the turbulent changes of the times.

Although this work has been referred to as the budget method of constructing supply curves, this may be misleading unless it is explained that a great deal more than budgeting was involved. A complete historical analysis of trends in production and related factors was undertaken for each area studied. In some of the areas, the analysis included information for many past years about each farm budgeted. In several instances, statistical analyses of short-time response were available or were undertaken to throw light on short-run changes. As much information as possible was obtained with which to evaluate the potential possibilities of each farm. Improved technology and practices and their probable rates of adoption were considered. Land additions and subtractions and changes in other resources were considered in terms of how they might affect the outcome.

One of the important things about the farm budget method is that it is a flexible system of incorporating in a future projection all that can be learned from other approaches. The techniques of linear programming and spatial models were not available at the time the work on the dairy interregional study was done. In a similar study today we would make use of the newer methods to complement but not to replace budgeting. Budgeting makes use of a sample of farms to test the possible production alternatives and to appraise them objectively so far as possible. The area of judgment is thus narrowed.

Even though formal farm budget analysis and construction of synthetic supply and demand curves may not be feasible in particular instances, the general ideas involved may be useful mental concepts for qualitative appraisal.

Summary

Analysis of long-run supply responses is of leading significance in the sphere of interregional competition. The principle of comparative advantage provides a general theoretical framework.

The present theory of comparative advantage evolved through four, or perhaps five, stages. These stages may be recognized under the headings of the principle of specialization, the principle of two-way comparative advantage between regions and between alternatives within regions, the theory of spatial location, the theory of mutual interdependence of demand and supply, and the theory of the time dimension.

The indicated method for attacking specific problems in interregional competition is eclectic. Precise procedures will vary with commodities and circumstances. But in general, historical and spatial analysis should come

first. Formal statistical and econometric methods can be used to learn as much as possible of cause and effect relationships.

Then some type of projection procedure suitable to the circumstances should incorporate the findings from all the preceding studies that bear on the situation. Projections may be either qualitative or quantitative. A simple trends methods may suffice, or a more formal method of accounting, for prospective variables may be used. The farm budget method is one means that simulates the behavior of the farm business unit. Assemblages of farm budget findings adjusted by judgments based on other approaches constitute a flexible method of rational projection.

Projections into the economic unknown are always fraught with uncertainty. No closed static model will suffice for the task, no matter how appealing it may seem. As someone has said, it is like the contrast between a painted Dutch interior and a raging ocean in a storm. The navigator on the vessel at sea makes use of all the tools at his command including judgment in charting his course.

INPUT-OUTPUT MODELS AS TECHNIQUES OF ANALYSIS FOR INTERREGIONAL COMPETITION*

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IN THE literature of agricultural economics, interregional competition refers to the competitive or rival position of spatially defined sectors. Focus is on how changes (a) in production functions, factor prices and institutions (and their effect on production possibility and supply functions) and (b) in demand functions, generate differential regional changes in product outputs, factor inputs, product and factor prices and farmer incomes. We are assigned to discuss, under the heading of interregional competition, a tool which concerns itself more with complementary interrelationships among sectors than with competitive characteristics. Hence, to place the method in proper perspective, we briefly review some major techniques available for spatial analysis, compare the input-output model very briefly with these; then review the nature of input-output models and, hence, indicate how it fits into analysis of interregional competition.

The ideal model for analysis of interregional competition would be a set of continuous equations defining the supply and demand functions for the relevant commodities and factors by regions. Model construction and specification would adequately incorporate "shifter" variables, to allow accurate forecasts and structural estimation in respect to change in technology, factor prices, institutions and other important variables. It is not likely, however, that regression models which coincide with this ideal are possible; particularly in accounting for "shifters" revolving around such major technological and factor market changes as have brought concentration of poultry production in the East and South or which encourage greater concentration of cattle feeding in the Southwest.

Another empirical candidate which is operationally manageable and can provide detail about interregional commodity flows, regional production patterns, resource use and producer income, is a programming model which supposes "stairstep" supply and demand functions and relevant short-run and long-run resource restraints. (An alternative, the programming model with a non-linear objective function, would be limited to few regions and products because of computational burdens.)

A model one step further removed from the ideal in degree of realism is a

* Giannini Foundation Paper No. 184, and Journal Paper J3757 of the Iowa Agricultural and Home Economics Experiment Station, project 1135, Center for Agricultural and Economic Adjustment.

** The authors make grateful acknowledgement to Douglas Caton and Gerald W. Dean for comments on earlier drafts of this paper, and to C. W. Crickman and Glen Barton for help on an original cooperative project with Farm Economics Research Division, USDA.

programming model which supposes demand and supply coefficients to be constants. Within each region, demand is a fixed quantity and supply curves are horizontal, restrained only by particular resource stocks. All programming models assume some prior knowledge of demand and supply structures. However, these models have this advantage over possible regression models: The regression models generally must be *ex post*, in the sense of being based on time-series data, and can never adequately account, as predictional devices, for such new developments as the technology and integration factors causing movement of broiler production to the Southeast. While difficult in data collection and burden of computation, programming models may allow a better analysis of major interregional shifts in production. But even here, the computational burden for a model of moderate detail is still great.

The next empirical step away from the ideal model, and beyond programming models, is the input-output model. For certain positive or descriptive uses it excels other models. But for projection of differential changes among regional sectors, it falls short of both regression and programming models. *Algebraically*, it is a convenient tool for making projections. *Realistically*, however, the projections have severe limitations, particularly for an industry such as agriculture. We base this statement on the algebraic assumptions underlying input-output models: namely, the assumption of constant input-output coefficients, zero rates of substitution and "fixed mix" requirements both within and among sectors. Thus, we view input-output analysis as one of potential in describing certain interrelationships among agricultural sectors at a particular point in time, and not as a main tool for projecting change. In this context, it is useful mainly to describe the empirical nature and degree of "complementarity interdependence" among sectors which might be defined as agricultural regions; rather than to express such competitive forces as the effect of improved technology or lower factor prices in one region on output, prices and income in another region.

Review of General Input-Output Model

Having ranked input-output analysis relative to certain other models available for research in interregional competition we might review, briefly, the general input-output model. This model provides an operational framework for¹ (1) describing, concisely and systematically, activity between economic sectors, and (2) analyzing and investigating various operations of the economy and quantifying interrelationships among the economic sec-

¹ For additional details on the Leontief input-output system see: W. Leontief, et al., *Studies in the Structure of the American Economy*, New York, Oxford Press, 1953; and National Bureau of Economic Research, *Input-Output Analysis: An Appraisal*, Princeton, Princeton University Press, 1955.

tors included in the model. The basis or descriptive phase of the model is written in mathematical notation as:

$$(1.1) \quad X_1 - x_{11} - x_{12} - \dots - x_{1n} = Y_1$$

$$(1.2) \quad X_2 - x_{21} - x_{22} - \dots - x_{2n} = Y_2$$

$$\vdots$$

$$(1.n) \quad X_n - x_{n1} - x_{n2} - \dots - x_{nn} = Y_n$$

where X_1, X_2, \dots, X_n represent gross output of specific economic sectors of the economy; x_{ij} ($i, j=1, \dots, n$) represents actual flows of goods and service from sector i to sector j ; and Y_i ($i=1, \dots, n$) are the flows to final demand sectors (household consumption, investment, government, foreign trade, inventory).

The basic assumption made in input-output analysis pertains to the relation between purchases of an endogenous sector (i.e., x_{ij}) and the level of output of this sector (i.e., X_j). Assuming a linear relationship (the appropriateness of this assumption for agriculture sectors will be discussed later) one obtains the equation:

$$(2) \quad x_{ij} = a_{ij}X_j + c_{ij}$$

where a_{ij} and c_{ij} are parameters.

For all empirical work, the further assumption is made that $c_{ij}=0$. The a_{ij} (commonly referred to as an input-output coefficient or technological coefficient) is derived from a single observation of the ratio between x_{ij} and X_j written as:

$$(3) \quad a_{ij} = x_{ij}X_j^{-1}$$

The input-output coefficient represents direct requirement of sector j upon sector i per unit of output of sector j . For example, if industry purchased 25 billion dollars worth of agricultural goods and total output for industry is 518 billion dollars, the related input-output coefficient is 25/518 or .05. That is, industry requires directly 5 cents worth of goods and service from agriculture per dollar of industry output.

Substituting (2), assuming $c_{ij}=0$, into (1.1, \dots , 1.n) yields:

$$(4.1) \quad X_1 - a_{11}X_1 - a_{12}X_2 - \dots - a_{1n}X_n = Y_1$$

$$(4.2) \quad X_2 - a_{21}X_1 - a_{22}X_2 - \dots - a_{2n}X_n = Y_2$$

$$\vdots$$

$$(4.n) \quad X_n - a_{n1}X_1 - a_{n2}X_2 - \dots - a_{nn}X_n = Y_n$$

or in matrix notation:

$$(4a) \quad X - AX = Y$$

where X is a vector of sector outputs, A is a matrix of input-output coefficients and Y is a vector of final demand quantities. Hence, with specified final demands Y_1, Y_2, \dots, Y_n and constant input-output coefficients, equations (4.1, \dots , 4. n) can be solved for the outputs X_1, X_2, \dots, X_n ; the resulting equations are given in (5.1, \dots , 5. n). The A_{ij} 's (commonly referred to as interdependence coefficients) are elements of the inverse matrix $(I-A)^{-1}$.

$$(5.1) \quad X_1 = A_{11}Y_1 + A_{12}Y_2 + \dots + A_{1n}Y_n$$

$$(5.2) \quad X_2 = A_{21}Y_1 + A_{22}Y_2 + \dots + A_{2n}Y_n$$

$$\vdots$$

$$(5.n) \quad X_n = A_{n1}Y_1 + A_{n2}Y_2 + \dots + A_{nn}Y_n$$

or in matrix notation

$$(5a) \quad X = (I - A)^{-1}Y.$$

The interdependence coefficients (A_{ij} 's) represent the direct and indirect requirements upon sector i for a one unit change in the amount of goods delivered to final demand by industry j . This analytical feature makes the tool pertinent to interregional relationships since the indirect as well as the direct effects of change are reflected among regions.

In summary, equations (1.1 to 1. n) and (4.1 to 4. n) represent the descriptive component while equations (5.1 to 5. n) represent the analytical aspects of an input-output model.

Regional Input-Output Model

Identification of the movement of goods and services among geographical areas provides the basis for interregional input-output models. Regional models have been outlined by Leontief,² Isard,³ Chenery,⁴ and others. The model devised by the authors for a regional study of agriculture is patterned primarily after the Isard model.⁵ Agricultural sectors are of prime interest and hence are defined with respect to location and type of product.⁶ In-

² W. Leontief, et al.—*op. cit.*, Chapter 4.

³ W. Isard, "Interregional and Regional Input-Output Analysis," *The Review of Economics and Statistics*, November 1951, pp. 318-328.

⁴ H. Chenery, Paul G. Clark, and Vera Cab Pinna, *The Structure and Growth of the Italian Economy*, U. S. Mutual Security Agency, Special Mission to Italy for Economic Cooperation, (Rome, Italy) 1953 (Mimeo.).

⁵ H. O. Carter and E. O. Heady, *An Input-Output Analysis Emphasizing Regional and Commodity Sectors of Agriculture*, Iowa Agr. Exp. Sta. Res. Bull. 469, 1959.

⁶ Two types of aggregation are feasible for agricultural sectors. 1) Classification by products and 2) classification by enterprises. The product basis was used because of the form of available data. Except for sketchy fragments, all agricultural statistics are published on a commodity or product basis. Independent of data problems, both classification schemes have limitations. The main objection to an enterprise classification is: output and input vary to an extent that

dustry sectors are defined only with respect to product. Specifically, the United States is segmented into ten census geographical regions. Each region is divided into nine agricultural commodity sectors. Thirteen non-farm industries are defined on a "national" basis and divided into three major categories: (a) industries processing agricultural products, (b) industries furnishing agriculture with major factor inputs, and (c) a single sector to represent all other industries.⁷ Final demand components are foreign trade export and import, government, inventories, and household.⁸ Thus, the model represents a national matrix with the agricultural sector "deaggregated" to give both location and product detail leaving industry sectors more highly aggregated. Consider, for example, a two sector model of the U.S. composed of industry and agriculture as provided in Figure 1.

The corresponding flow equations for Figure 1 are:

$$(6.1) \quad X_1 = x_{11} + x_{12} + Y_1$$

$$(6.2) \quad X_2 = x_{21} + x_{22} + Y_2$$

The agriculture sector (X_1) is expanded into 10 regions with 9 commodities in each region. Further, the industry sector is expanded into 13 separate

coefficients are not uniquely defined. For example, dairy farmers produce both cash and feed crops. The proportions within each farm vary over time depending on relevant price relationships and individual preferences. Product grouping also has disadvantages in that large numbers of agricultural commodities are joint products. Hence, the distribution of inputs among commodity groups is difficult and sometimes arbitrary since there is no established basis for allocating inputs such as machinery, building depreciation, petroleum products, etc. among individual products.

⁷ The 9 farm commodity sectors and the 13 non-farm sectors are:

<i>Farm commodity sectors</i>	<i>Non-farm industries</i>
	<i>(processing)</i>
1. Livestock and livestock products	0.10 Meat and poultry processing
2. Feed grains	0.11 Dairy products
3. Food grains	0.12 Grain processing
4. Forage crops	0.13 Prepared foods
5. Vegetables and fruit	0.14 Miscellaneous food processing
6. Cotton	0.15 Vegetable and fruit processing
7. Tobacco	0.16 Tobacco manufacturing
8. Oil crops	0.17 Textile products
9. Miscellaneous agriculture	<i>(furnishing sectors)</i>
	0.18 Fertilizers
	0.19 Chemical products
	0.20 Machinery and related services
	0.21 Petroleum products
	<i>(others)</i>
	0.22 All other industries

⁸ Final demand sectors for regional commodity groups are defined to include only value of products consumed on farms where grown (e.g., livestock slaughtered for home use, corn used for home use, both liquid and solid). Thus, in the regional portion of the model, flows from region i to the household sector in region j are all zero. This procedure, in effect, specifies that all agricultural commodities must flow to a processing sector even though the degree of "processing" may vary considerably among commodities.

FIGURE 1. FLOW MATRIX FOR TWO-SECTOR ECONOMY OF AGRICULTURE AND INDUSTRY

	Agric.	Ind.	Final demand
Agric. (X_1)	I x_{11}	II x_{12}	Y_1
Ind. (X_2)	III x_{21}	IV x_{22}	Y_2

product sectors (but not on a regional basis). Thus, the resulting equations corresponding to (6.1) and (6.2) are written:

$$(7.1) \quad X_i^k = \sum_s \sum_j x_{ij}^{ks} + \sum_r x_{ir}^k + Y_i^k$$

$$(7.2) \quad X_h = \sum_s \sum_j x_{hj}^s + \sum_h x_{hr} + Y_h$$

where $i, j=1, 2, \dots, 9$ denote agricultural commodity groups within regions; $h, r=10, 11, \dots, 22$ denote national industry sectors and $k, s=1, 2, \dots, 10$ denote agricultural regions.

Figure 2 shows the expanded version of the economy with regional agricultural sectors and product groupings in industry. Quadrant I in Figure 1 is blown up from a single entry (x_{11} in Figure 1) to a 90-order submatrix

$$\left(\sum_s \sum_j x_{ij}^{ks} \right)$$

shown in Figure 2. Whereas x_{11} denoted the aggregate internal flow within agriculture in equation (6.1), individual elements in the 90-order submatrix indicate internal flows between agricultural commodities within and between regions. For example, $x_{2.1}^{1.2}$ denotes the value of commodity 2 (feed grains) produced in region 1 (Northeast) consumed by commodity 1 (livestock) in region 2 (Cornbelt).

Quadrant II in Figure 1 is expanded from x_{12} to a 13×90 submatrix

$$\left(\sum_r x_{ir}^k \right).$$

Similarly, Quadrant III is expanded from x_{21} to a 90×13 submatrix

$$\left(\sum_s \sum_j x_{hj}^s \right)$$

FIGURE 2. FLOW MATRIX FOR REGIONAL AGRICULTURAL MODEL

Agriculture		Industry	Final Demand
I		II	
$X_1^1 = x_{1,1}^{1,1} + x_{1,2}^{1,1} + \dots + x_{1,9}^{1,1} + x_{1,10}^{1,10}$	$x_{1,1}^{1,2} + x_{1,1}^{1,3} + \dots + x_{1,1}^{1,9} + x_{1,1}^{1,10}$	$+ x_{1,10}^1 + \dots + x_{1,r}^1 + \dots + x_{1,22}^1$	$+ Y_1^1$
$X_2^1 = x_{2,1}^{1,1} + x_{2,2}^{1,1} + \dots + x_{2,9}^{1,1} + x_{2,10}^{1,10}$	$x_{2,1}^{1,2} + x_{2,1}^{1,3} + \dots + x_{2,1}^{1,9} + x_{2,1}^{1,10}$	$+ x_{2,10}^1 + \dots + x_{2,r}^1 + \dots + x_{2,22}^1$	$+ Y_2^1$
\vdots	\vdots	\vdots	\vdots
$X_9^1 = x_{9,1}^{1,1} + x_{9,2}^{1,1} + \dots + x_{9,9}^{1,1} + x_{9,10}^{1,10}$	$x_{9,1}^{1,2} + x_{9,1}^{1,3} + \dots + x_{9,1}^{1,9} + x_{9,1}^{1,10}$	$+ x_{9,10}^1 + \dots + x_{9,r}^1 + \dots + x_{9,22}^1$	$+ Y_9^1$
$X_{11}^2 = x_{1,1}^{2,1} + x_{1,2}^{2,1} + \dots + x_{1,9}^{2,1} + x_{1,10}^{2,10}$	$x_{1,1}^{2,2} + x_{1,1}^{2,3} + \dots + x_{1,1}^{2,9} + x_{1,1}^{2,10}$	$+ x_{1,10}^2 + \dots + x_{1,r}^2 + \dots + x_{1,22}^2$	$+ Y_{11}^2$
\vdots	\vdots	\vdots	\vdots
$X_{11}^k = x_{1,1}^{k,1} + x_{1,2}^{k,1} + \dots + x_{1,9}^{k,1} + x_{1,10}^{k,10}$	$x_{1,1}^{k,2} + x_{1,1}^{k,3} + \dots + x_{1,1}^{k,9} + x_{1,1}^{k,10}$	$+ x_{1,10}^k + \dots + x_{1,r}^k + \dots + x_{1,22}^k$	$+ Y_{11}^k$
\vdots	\vdots	\vdots	\vdots
$X_9^{10} = x_{9,1}^{10,1} + x_{9,2}^{10,1} + \dots + x_{9,9}^{10,1} + x_{9,10}^{10,10}$	$x_{9,1}^{10,2} + x_{9,1}^{10,3} + \dots + x_{9,1}^{10,9} + x_{9,1}^{10,10}$	$+ x_{9,10}^{10} + \dots + x_{9,r}^{10} + \dots + x_{9,22}^{10}$	$+ Y_9^{10}$
III		IV	
$X_{10}^1 = x_{10,1}^1 + x_{10,2}^1 + \dots + x_{10,9}^1 + x_{10,10}^2 + \dots + x_{10,9}^{10}$	$x_{10,1}^2 + x_{10,1}^3 + \dots + x_{10,1}^9 + x_{10,1}^{10}$	$+ x_{10,10}^1 + \dots + x_{10,r}^1 + \dots + x_{10,22}^1$	$+ Y_{10}^1$
\vdots	\vdots	\vdots	\vdots
$X_A^1 = x_{A,1}^1 + x_{A,2}^1 + \dots + x_{A,9}^1 + x_{A,10}^2 + \dots + x_{A,9}^{10}$	$x_{A,1}^2 + x_{A,1}^3 + \dots + x_{A,1}^9 + x_{A,1}^{10}$	$+ x_{A,10}^1 + \dots + x_{A,r}^1 + \dots + x_{A,22}^1$	$+ Y_A^1$
\vdots	\vdots	\vdots	\vdots
$X_{22}^1 = x_{22,1}^1 + x_{22,2}^1 + \dots + x_{22,9}^1 + x_{22,10}^2 + \dots + x_{22,9}^{10}$	$x_{22,1}^2 + x_{22,1}^3 + \dots + x_{22,1}^9 + x_{22,1}^{10}$	$+ x_{22,10}^1 + \dots + x_{22,r}^1 + \dots + x_{22,22}^1$	$+ Y_{22}^1$

Agric.

Industry

FIGURE 3. INPUT-OUTPUT COEFFICIENTS FOR REGIONAL AGRICULTURAL MODEL

	Agriculture	Industry
Agriculture	I $a_{ij}^k = x_{ij}^k/x_j^s$	II $a_{ir}^k = x_{ir}^k/X_r$
Industry	III $a_{hj}^s = x_{hj}^s/X_j^s$	IV $a_{hr} = x_{hr}/X_r$

and Quadrant IV from x_{22} to a 13 order submatrix

$$\left(\sum_h x_{hr} \right).$$

For purposes of comparison, the national model is blown up from a 2×2 matrix to a "hybrid" regional model with a 103×103 matrix.

In order to extend the above descriptive phase of the model into an analytical framework, input-output coefficients are defined for each submatrix (Figure 3). Hence, output of each individual sector can be solved in terms of Y_i^k and Y_h as follows:

$$(8.1) \quad X_i^k = \sum_s \sum_j A_{ij}^{ks} Y_j^s + \sum_r A_{ir}^k Y_r$$

$$(8.2) \quad X_h = \sum_s \sum_j A_{hj}^s Y_j^s + \sum_r A_{hr} Y_r$$

The interdependence coefficients corresponding to each submatrix are given in Figure 4.

FIGURE 4. INTERDEPENDENCE COEFFICIENTS FOR REGIONAL AGRICULTURAL MODEL

	Agriculture	Industry
Agriculture	I A_{ij}^k	II A_{ir}^k
Industry	III A_{hj}^s	IV A_{hr}

Information from Regional Input-Output Model

The preceding section is concerned with one type of economic and mathematical formulation of a regional input-output model. The complete empirical counterparts of these formulations are not included in this paper.⁹ However, to provide insights into the type of results that are obtained from the use of a regional input-output model, this section summarizes some of the more important relationships derived from the basic matrices (103×103 order) and from matrices aggregated from the basic matrices.

The derived interdependence matrix indicates a total impact on agriculture (the sum of the direct, indirect and circular effects) associated with the delivery of one dollar of agricultural processing products *outside* to final demand of 59.1 cents (Table A-2). Twenty-five percent, or 15.3 cents of the output generated in agriculture would occur in the Cornbelt, more than twice the effect on any other region. Interestingly, the corresponding direct requirements of agricultural processing industries upon the Cornbelt are 8.7 cents (Table A-1). Consequently, indirect output in the Cornbelt, generated by a one dollar change in agricultural processing industry *output* (not a one dollar delivery to final demand) is 3.8 cents.¹⁰ For example, 3.8 cents or 30 percent of the induced Cornbelt output is associated in part with (1) shipments of feed grains to livestock sectors (outside of the Cornbelt) that subsequently sell their product (beef, pork, etc.) to processing sectors and (2) shipments of feed grains to prepared feed processing (a part of the over-all agricultural processing industry). In this case livestock sectors from all regions, whose products eventually flow to processing industries, purchase the prepared feeds.

It is also possible from the model constructed to analyze the impact on regional commodity groups, the agricultural region in total and individual industry sectors, resulting from deliveries to final demand from each individual sector defined previously. The livestock sector in the Pacific States can be used as an example.

Each dollar of livestock products in the Pacific States delivered to final demand required, directly and indirectly, 2.0 cents of feed grain output in the Cornbelt, 2.5 cents of livestock output in the Southern Plains, 9.2 cents of livestock output in the Mountain States, and 2.0 cents of forage crop output in the Mountain States. The induced output of 2.0 cents from feed grains in the Cornbelt consists chiefly of direct grain shipments to the prepared feed sector which, in turn, are purchased for (a) livestock in the Pacific States, and (b) feeder livestock raised in other regions and purchased

⁹ For a more complete summary of results, see: H. O. Carter and E. O. Heady, *op. cit.*

¹⁰ For purposes of comparing the relative magnitudes of direct and indirect effects it is necessary to standardize the interdependent coefficient such that it relates to output rather than deliveries to final demand. This standardizing is done by dividing the interdependent coefficient by the diagonal element in the respective column.

TABLE A-1. INPUT-OUTPUT COEFFICIENTS, UNITED STATES ECONOMY, 1954.^a AGGREGATION OF AGRICULTURAL REGIONS AND INDUSTRY

	Agricultural regions										Industry		
	I North- east	2 Corn- belt	3 Lake States	4 Appal. States	5 South- east	6 Delta States	7 S. Plains	8 N. Plains	9 Mount. States	10 Pacific States	I ^b Agric. processing	II ^c Agric. fur- nishing	III ^d All other
1	.22612	—	—	—	—	—	—	—	—	—	.04031	.00058	.00007
2	.00319	.29053	.00018	.00725	—	.02396	.00276	—	—	—	.08737	.01074	.00002
3	.00090	.00083	.30210	—	—	—	—	—	—	—	.08882	.00219	.00002
4	.00102	.00021	—	.23295	—	—	—	—	—	—	.03338	.00136	.00006
5	—	—	—	—	.20487	—	—	—	—	—	.02474	.00143	.00008
6	—	—	—	—	—	.16074	—	—	—	—	.01582	.00197	.00003
7	—	.00471	—	.00287	.00213	—	.17270	.00579	—	.00765	.02578	.00225	.00002
8	.00342	.01768	.00470	—	—	—	.00878	.30698	.00141	.00688	.03086	.00268	—
9	—	.00439	.00261	—	—	—	.02092	.02782	.28990	.01986	.02155	.00090	.00002
10	—	—	—	—	—	—	—	.00012	—	.15559	.04390	.00097	.00006
I	.00207	.00111	.00204	.00102	.00033	.00055	.00131	.00203	.00226	.00152	.14866	.02639	.03005
II	.30137	.15573	.17937	.19690	.20392	.18759	.19868	.16707	.15950	.17423	.04086	.23730	.03649
III	.11664	.15432	.12506	.11483	.11053	.11815	.13538	.16874	.13370	.13502	.10948	.36403	.35214

^a Each entry shows direct purchases from the sector named at the left by the sector named at the top per dollar of output by the latter.^b I consists of ISC sectors 0.10, 0.11, 0.12, 0.14, 0.15, 0.16, and 0.17.^c II consists of ISC sectors 0.13, 0.18, 0.19, 0.20, and 0.21.^d III consists of ISC sector 0.22.

TABLE A-2. INTERDEPENDENCE COEFFICIENTS, UNITED STATES ECONOMY, 1954.^a AGGREGATION OF REGIONS AND SUBDIVISIONS OF INDUSTRY

	Agricultural regions										Industry		
	I North- east	2 Corn- belt	3 Lake States	4 Appal. States	5 South- east	6 Delta States	7 S. Plains	8 N. Plains	9 Mount. States	10 Pacific States	I ^b Agric. fur- processing	II ^c Agric. fur- nishing	III ^d All other
1	1.29475	.00196	.00204	.00184	.00173	.00164	.00188	.00225	.00191	.00172	.06269	.00481	.00333
2	.01928	1.41862	.01014	.02263	.00897	.04851	.01390	.01025	.00886	.00825	.15302	.02979	.00832
3	.00567	.00351	1.43589	.00281	.00267	.00251	.00281	.00822	.00277	.00253	.06762	.00829	.00366
4	.00551	.00240	.00213	1.30567	.00186	.00176	.00198	.00230	.00197	.00179	.05281	.00560	.00289
5	.00230	.00165	.00174	.00162	1.25920	.00144	.00162	.00187	.00160	.00147	.03778	.00476	.00218
6	.00207	.00140	.00151	.00143	.00138	1.19280	.00142	.00158	.00137	.00127	.02317	.00458	.00139
7	.00801	.01030	.00223	.00664	.00519	.00204	1.21092	.01239	.00199	.01284	.04018	.00628	.00227
8	.01091	.03910	.01297	.00844	.00296	.00374	.01855	1.44661	.00580	.01469	.06020	.00944	.00333
9	.00267	.01208	.00746	.00190	.00168	.00178	.03793	.05879	1.41003	.03544	.04319	.00483	.00233
10	.00277	.00208	.00217	.00198	.00186	.00176	.00201	.00258	.00203	1.18609	.06265	.00533	.00333
I	.04021	.03175	.03280	.02914	.02705	.02594	.02997	.03663	.03105	.02762	1.19920	.07093	.05963
II	.52243	.33461	.37292	.37022	.36519	.32879	.32760	.36909	.32627	.31155	.23448	1.37193	.06838
III	.56233	.54855	.50184	.45425	.43073	.42168	.47719	.61010	.48577	.44431	.46126	.80093	1.61033

^a Each entry shows the amount that the gross output of the sector named at the left would change, given a change of one dollar in the final demand for products of the sector named at the top.

^b I consists of ISC sectors 0.10, 0.11, 0.12, 0.14, 0.15, 0.16, and 0.17.

^c II consists of ISC sectors 0.13, 0.18, 0.19, 0.20, and 0.21.

^d III consists of ISC sector 0.22.

in the Pacific States. Other more indirect "ties" could also be established to account for output in the Cornbelt and also in other regions.

Input-output models have also been used for projecting output in future time periods.¹¹ Except for the short run, say one to five years, projections with the static input-output model have serious limitations for agriculture because of (1) changing technical coefficients and factor substitution, and (2) differential income elasticities of demand attached to agricultural products.

Limitations in Interregional Competition

We now review some of the limitations of input-output models in analysis of interregional competition. One limitation revolves around the "fixed mix" assumption and can be illustrated from some of the more descriptive steps in the analysis. Without examining the direct and indirect effects of changes in final demand on output in a particular sector, we can examine, under certain assumptions and conditions the effect of a proposed change in output in the j th producing sector on outputs in the i th sector (i.e., on the amount of output in the i th sector necessary to serve as an input in the j th sector). Suppose that j refers to livestock production in one region and i refers to feed grain production in another. Then a_{ij} indicates the additional amount of grain which would need to be produced in i , to allow a unit increase in output by j . This interpretation would be entirely correct if j obtained the class of inputs only from i . However, at the time for which data apply, j may have obtained part of its requirement from i , and part from other regions. If sector j is to increase livestock output, interpretations as above suppose that its incremental feed imports are met by flows of grain from crop regions in proportion to the a_{ij} 's. For example, if region j has been importing feed grain from regions g and k , the model assumes increase in livestock production in j to be forthcoming from incremental imports in the ratio $a_{gj}a_{kj}^{-1}$ from the two grain-producing regions, regardless of the level to which livestock production and feed imports in j are increased. "Fixed mix" projections might approach reality for small regional changes. But for larger regional shifts we could not expect allocation of grain imports by deficit regions from surplus regions to correspond to the pattern of the past. At this point in analysis of regional interrelationships, a conventional programming model would better specify how an increased output from one sector might be forthcoming through changed proportions of inputs from

¹¹ For purposes of comparison, the regional agricultural model discussed in this paper was used for projections of agricultural outputs in 1960 and 1975, based on derived structures in 1954. Projections of future demand for farm products were based primarily on those made by Rex Daly. A complete summary of the regional projections is given in H. O. Carter and E. O. Heady, *op. cit.*

other regions. The coefficients, p_{ij} of the requirements matrix in a programming model can show the "degree of competition" between sectors which furnish inputs. Whereas the ratio $a_{gj}a_{kj}^{-1}$ shows the "complementary rate" at which inputs from the g th and k th sector must be combined to produce an output unit in the j th sector, the ratio $p_{gj}p_{kj}^{-1}$ in a programming model shows the rate at which inputs from the g th sector can be replaced by those of the k th sector in increasing output of the j th sector by one unit. (If the ratio is negative, inputs from g and k are complementary.)

For regional models such as those discussed here, the questions of constant returns to scale and intraregion constancy in comparative advantage arise. The question of scale returns for production units and firms is not greatly important. Pork production from a single hog will encounter diminishing returns, but two hogs of the same size and quality can be produced with twice as many inputs. In competitive non-farm industries where land area or space is not limitational, scale returns and "constancy in comparative advantage" are not serious problems. Each firm might have ranges of both increasing and decreasing returns, but we could assume that competition leads them to produce at points of constant scale returns. More firms, producing at constant returns, could be added to allow the greater output. While farms are competitive, output from a region still must be produced under the restraint of a fixed supply of land. Output in settled regions must be increased, not by addition of farm numbers, but by more intensive use of land (fertilization, irrigation, etc.). Non-linear technical and interdependence relationships are then encountered.

In programming models, this problem can be handled by defining additional activities for the particular region, with the technical coefficients increased accordingly. In input-output analysis, it might seem that we could "disaggregate" regions to allow consideration of land of different productivities when used with other inputs; or define "artificial fertilization sectors," which would have coefficients representing each level of (say) fertilization. However, this is not a "feasible" alternative because of the "fixed mix" restraint of the model. Rather than to allow an increase in final demand to be filled most economically (drawing first from "low cost" acres not requiring fertilization, then from those with "low level of fertilization," then from those with a higher level, etc.) it would require that the increase in final demand be met from all real and "artificial" (non-fertilized, medium fertilized, etc.) sectors in fixed proportion of the type explained above.

In this sense, input-output models have greater limitations for analysis of crop production and cattle and sheep ranching than for broiler, hog and cattle feeding. The latter types of production do not encounter the same types of land or spatial restraints as outputs are increased. The importance of this limitation to crop production also depends on the extent to which an

input is being fully used in a particular region, in a spatial sense, at the time for which input-output coefficients are derived.

Agriculture has other properties which make the assumption of fixed technical coefficients questionable. For example, it is generally felt that agricultural production is subject to a great many more unpredictable and uncontrollable variables than industry. Moreover, these chance variations, such as weather, pestilence and plant and animal diseases, affect inputs as well as outputs. Another problem is that of capital formation. That is, it is generally assumed that formation of capital goods occurs in a different sector other than the sector using these goods. In agriculture, capital goods can be accumulated simultaneously with the production of current output. Examples are breeding livestock and basic soil fertility. Other problems could be mentioned; however, the above discussion summarizes the primary conceptual limitations for agricultural applications of the input-output model.

Summary and Conclusions

This paper has taken as its assignment to outline the features and limitations of input-output analysis as a technique for interregional competition studies in agriculture. The strong features of the model are readily apparent: It allows a comprehensive picture of the regional economies; the complex set of interrelationships between regions and sectors are quantifiable. The *indirect effects* as well as the direct effects of final demand changes can be ascertained. The weak features of the model are equally apparent: Fixed and linear input-output coefficients determined on the basis of a single observation at a given point in time may render spurious answers. Fixed coefficients also imply a constant comparative advantage between regions, making long-run projections with the model unrealistic. Too, since mass quantities of data are required, it is an expensive type of research endeavor.

The authors, in conclusion, feel that the input-output technique provides a structural framework that is useful as a bench-mark or "spring-board" for more specialized interregional competition studies. That is, we characterize the model as useful for descriptive purposes in viewing certain interrelationships among various spatial sectors of agriculture, and between these sectors and the sectors which provide inputs to or purchase outputs from agriculture. We do not recommend it as a tool for penetrating analyses of interregional competition of regional agricultural sectors. Contrawise, it is a method which explains the "togetherness" of regions, rather than their relative strength as rivals. Hence, it provides little insight into how changes in production functions, factor markets, and institutional organization may bring about differential changes in outputs, inputs, prices and incomes by regions.

DISCUSSION: INTERREGIONAL COMPETITION IN AGRICULTURE

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This year each discussant was asked to study the papers on interregional competition in agriculture and to comment upon them as a group and as individual papers. This method turned out to be an excellent technique as far as these three papers were concerned because of their complementary effects as well as their independent contributions.

As a discussant, I have chosen to emphasize the unity of treatment by the authors as they have discussed segments of the problem area. Several questions are raised and one possible conceptual technique is explored.

The stimulating paper by Hassler gives a clean-cut statement of the problem. Speaking of the demand-supply determinants in interregional competition he requires that "the basic framework must be constructed in the space, form, and time dimensions with meaningful criteria underlying the decisions of the human agents involved." He tempers the scope of this task considerably by an appeal to simplification at the expense of realistic detail. Then follow three explicit basic postulates dealing with demand, supply, and institutional and technological conditions. Many assumptions are indicated implicitly. Two alternative analytical models are then identified, and a choice is made in favor of the efficiency model as opposed to the descriptive-predictive model. The basis of choice was the relative ability of the model to meet a dynamic situation. He states ". . . descriptive-predictive models (even of the so-called structural type) specify interdependent functional relationships and employ realized data for estimating the specified parameters. Their utility lies in average description of the way the structure did operate or might operate into the future—provided stability of interactions can be assumed or expected. No direct concept of efficiency is involved. These models do have important practical applications and are significant areas of pursuit. Nevertheless, efficiency model analyses are on a higher plane of significance—being diagnostic or active instead of passive appraisers of economic systems."

This position is confirmed by Heady and Carter in their discussion of input-output models which would fall within the descriptive-predictive type. They state that: "For certain positive or descriptive uses, it excels other models. But for projection of differential changes among regional sectors, it falls short of both regression and programming models. *Algebraically*, it is a convenient tool for making projections. *Realistically*, however, the projections have severe limitations, particularly for an industry such as agriculture. . . . Thus, we view input-output analysis as one of

potential in describing certain interrelationships among agricultural sectors at a particular point in time, and not as a main tool for projecting change."

In addition, their identification of the problem area is similar to that of Hassler, and, although less explicit, so too are the assumptions.

Mighell reviews the development of theory and practice in the problem area and concentrates upon the synthesis of long-run supply curves based upon estimates of sample producer response. This technique is advocated to cope with long-run changes in the economic environment. But he recognizes the difficulty of making estimates of internal and external relationships and calls upon other techniques to give guidance.

This is the unity of the three papers—the problem area and assumptions are similar and the alternative models discussed are complementary, not contradictory.

In my opinion, the efficiency model and budgetary model are the most exciting. Hassler has presented models which include space, time, and a type of form as explicit variables and, through the use of programming, solutions are computationally feasible. The use of such techniques to minimize transportation costs has been applied in milk, egg, beef, and grain sectors of agricultural production. Such applications are a beginning and have great value as a first step and as indicators of the information required and its form. Some benefit may also accrue from the capacity of the model to be indicative of direction and magnitude of disturbance in the system from a change in the parameters. This would permit an evaluation under very restricted conditions of the consequences of external action or decisions on the part of government or some powerful group. This could be of strategic value to these entities.

A warning flag might be waved before the researchers in this area. Close acquaintance with the model and an attention to its details develops a callousness to the extremely restrictive assumptions. For example, one can become conditioned to state that markets will be represented by a single point in each region and that the transportation function between all possible pairs will take a certain form. In our work on milk marketing in Connecticut, we concluded that such an assumption conceptually meant that the entire state was one vast, level, hard-surfaced highway. This warning is not meant to discourage our researchers for did not Von Thünen have a simplified countryside for his logic? But my experience has been that model builders sometimes forget reality as they "carry on" with their models.

In the budgetary techniques discussed by Mighell, the opportunity exists to appraise a more dynamic environment than with the efficiency model. Again, simplifying assumptions are needed. However, through recourse to other techniques and an application at the firm unit level, the

researcher must face realism by being explicit on the assumptions and their effects. Aggregative predictive ability may well be quite favorable with this method. The adequacy of the sample design and the ability of the worker to estimate human reactions are vulnerable points. My faith in this latter ability was shaken somewhat by an experience in connection with the wartime production capacity reports. A detailed study of sample dairy farms in Vermont was made to predict milk response potential to an improved price-cost situation. In the budgetary work, the resources of each farm were considered as well as the stated objective and reaction of each farm operator. Later, it was possible to check actual response with the predictions. In the aggregate, the two were practically identical. A comparison, farm by farm, shows no significant relationship between the predicted response and actual accomplishment.

Before leaving the papers, I wish to question one of the stated assumptions. With reference to land, one statement read, "location and general climatic aspects are unalterable." Unless I misunderstand the author's intent, I believe that impact of many internal and external technologies does alter these characteristics.

Finally, one comment of a conceptual nature. In striving for a theory of dynamics, economists may be seeking an unattainable goal. Present economic theory does not embrace the necessary content for a dynamic interpretation in that knowledge of present specific properties of the state of the system does not enable one to deduce all future states. Yet prediction and control are the basic needs of economics as of all sciences. As an alternative, the quasi-dynamic system suggested by Hicks¹ may be useful. The plan, the commitment of resources, the production period, the discounting possibilities, the maximization of an income flow through time—all lend themselves to the problem of interregional competition where the stated problem area involves construction of a framework in the space, time, form dimensions. The delimitations may provide rational breaks for the planning periods. Thereby, problems emanating from discontinuities in these dimensions may be minimized by use of this theory.

DISCUSSION: INTERREGIONAL COMPETITION IN AGRICULTURE

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These three papers provide a useful addition to the literature available on methods and procedures applicable for conducting research on problems of interregional competition. They merit careful study by all who are

¹ Hicks, J. R., *Value and Capital*, 2nd ed., Oxford: Clarendon Press, 1946.

concerned with economic research on regional or area adjustments in the production and marketing of farm products. However, some of us may want to review matrix algebra before we attempt to dig deeply into them.

Dr. Hassler's paper is a good illustration of a statement that appears on the first page of R. G. D. Allen's *Mathematical Analysis for Economists*, which says, "The mathematical technique is abstract and must be developed apart from its application." It also is illustrative of a statement that appears on the first page of *Economic Models*, by E. F. Beach, which says that economic models are "concerned with that part of economic theory that can be expressed in quantitative terms. Clearly this is not the whole of economic theory; but equally clearly it is an essential part of it." Beach also points out that "how useful econometric models can be in terms of policy or prediction is still a matter of considerable doubt."

Dr. Hassler presents an excellent, although relatively brief, discussion of the purposes or objectives of interregional competition studies. He points out that theoretical economic models may be developed (1) for use in describing or predicting economic phenomena or, (2) for use in deciding how efficiency of resource use or production can be improved. By description and prediction, I suppose him to mean better measurement and explanation of aggregative changes in resource use, production, and prices in the different sectors of the agricultural areas and regions.

Dr. Hassler emphasizes that economists are interested in the details of an efficient structure of agricultural production and resource use. This is certainly true. However, I think it very important to define efficiency quite broadly or, if we don't do this, to recognize that there are other objectives that farmers, as well as others, want to maximize. Certainly, prices that have prevailed recently for some farm products are relatively poor indicators for measuring optimum resource use. Dr. Hassler recognizes what I refer to here when he says in the last part of his paper, where he discusses the application of findings from efficiency analyses to policy decisions, "The results are an essential, logical portion of a broader base of information to aid in reaching a decision."

I think a more explicit answer is needed to the question, Why conduct research on interregional competition, location of production, or regional adjustments? Research on these subjects can provide useful information to individual farm and marketing firms and to public policymakers in making decisions that affect resource use, production, prices, and incomes. Incidentally, among public policymakers, I would include the many organized interest groups, as well as the general public.

Dr. Mighell's paper may be referred to, to illustrate how interregional competition studies may provide information useful for decision making. He says his "interest in interregional competition lies in the area of long-run supply responses." In the dairy studies to which he refers, information

about the probable position of the long-run supply curve for milk from farms in the Lake States presumably was useful in deciding what would be the long-run demand curve for milk from farms in New England and in view of this, what decisions farm and dairy marketing firms in New England should make with regard to resource use in milk production. It is of considerable interest, I think, that Dr. Mighell emphasizes analyses of probable production or supply response as a step in deciding what adjustments individual firms and regions may need to make to maintain or improve economic efficiency.

I have no special comments to make about the paper presented by Dr. Carter except to compliment him on a job well done. Dr. Carter emphasizes that his study using input-output analysis is mainly a description of resource-product relationships for one time period. To me, the study to which Carter and Heady refer is a very worthwhile kind of description. It should help to provide an improved basis for deciding what kinds of changes in resource use will improve efficiency and at the same time improve rates of return to resources employed in agriculture.

A reading of these papers leaves me a little impatient when I think of what agricultural economists might do to provide better information for use in making individual firm and public policy decisions that affect resource use. Data required for the models outlined by Dr. Hassler are relatively large. For example, we would need to know the supply and demand functions for individual products by areas or regions. I wonder whether there are not other less comprehensive procedures that will provide relatively good answers to our many adjustment problems. Changes in the location of production and resource use have been relatively great in recent years, and our record for predicting them is not especially good. For example, the total harvested acreage of crops has decreased by a fourth in the South since 1940, and in some southern States, the farm population has decreased by half.

We need to do a better job of describing or defining location-of-production problems. Consider the wheat-adjustment question. Production has been much larger than can be disposed of at prevailing prices. Less production may be the answer. But where should production be reduced? Immediately, a number of regional or area "interest" problems arise. Here, I think, historical and institutional economic analysis should help in deciding how conflicting interest may be resolved.

Finally, if in order to bring agricultural output into balance with market outlets at prices profitable to farmers we need to reduce the intensity of land use or shift to more extensive farming systems in some areas, certain questions need to be answered, among them: What are these adjustments? How can farmers become informed about them? What kinds of policies and programs can help farmers achieve them?

STUDIES OF INTERREGIONAL COMPETITION

Chairman: Kenneth E. Ogren, Agricultural Marketing Service

TRANSPORTATION MODELS IN STUDIES OF INTERREGIONAL COMPETITION*

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DURING its first fifty years, the agricultural economics profession has faced a continuing challenge to develop a model that is useful in explaining and forecasting the locations of particular lines of agricultural production. This paper describes the general problem area involved and appraises one model that appears to have great potential usefulness.

Classical Concepts

The concept of comparative advantage was developed by Ricardo and elaborated by Mill.¹ Location of production is held to be determined by relative, rather than absolute, costs of production. The concept is best illustrated in terms of two regions and two products. In each region, the cost of producing Product A can be expressed as a ratio to the cost of producing Product B. Product A will be produced in that region for which the ratio so formed has the lesser value and Product B in the other region. The concept of comparative advantage has a more elaborate theoretical significance than the above statement indicates. However, it has serious limitations if more than two regions or two products are to be considered; it does not explicitly incorporate costs of transporting commodities among regions, and it takes factor costs to be point values rather than price-quantity functions.

A different approach to explanations of regional specialization and interregional trading is found in the works of such location theorists as von Thünen, Weber, Lösch, and Isard.² The location theory begins with explanation of locations of various productive activities in an isolated city-

* Contribution from the Department of Agricultural Economics, North Carolina Agricultural Experiment Station, Raleigh, North Carolina. Published with the approval of the Director of Research as Paper No. 1071 of the Journal Series. The authors are grateful for assistance received from co-workers and especially for suggestions by George S. Tolley and James A. Seagraves.

¹D. Ricardo, *The High Price of Bullion* (1810); J. S. Mill, *Essays on Some Unsettled Questions of Political Economy* (1844).

²J. H. von Thünen, *The Isolated State*, (1826); A. Weber, *Manufacturing Industry Within the Economic System* (1909); A. Lösch, *The Economics of Location*, Yale University Press, New Haven, 1954; W. Isard, *Location and Space Economy*, MIT Press and John Wiley and Sons, Inc., New York, 1956.

state with a land area having homogeneous resources; bulky and perishable goods are produced near the city, while concentrated and durable products are drawn from more remote points. The theory is elaborated to include uneven distribution of resources; factories are so located that the summed costs of assembling raw materials and distributing finished goods are minimized. In contemporary location theory, much attention is given to determination of borders of raw material supply areas and product distribution areas; emphasis is placed upon the role of transportation costs in markets having numerous competing firms.

Location theory is rich in material for construction of models useful in empirical research. Two empirical studies using classical location theory have a special interest here; one is a 1942 study of Connecticut milksheds by Hammerberg, Parker, and Bressler, and the other is the 1952 award winning study of Northeastern milksheds by Bredo and Rojko.³ Both studies are concerned with determination of competitive milkshed boundaries and the mapping of continuous price surfaces. Levels of fluid milk production and consumer requirements for milk products in small sectors of the price surface are taken as given, and boundaries of milksheds are determined by a time-consuming trial and error process. Both studies mention the impracticality of introducing supply and demand as variables depending upon price, and both note that the equilibrium solutions obtained would indirectly result in minimizing the total transportation costs involved in clearing the market.

Point-trading models are closely related to the continuous price surface models described above. However, boundaries of surplus and deficit areas are taken as given, a representative shipping or receiving point is designated for each area, and the emphasis is placed upon determination of prices and quantities traded at the representative points.

Transportation Models

The transportation model is the simplest form of the point-trading models. The amount of surplus or deficit must be specified for each region. Additional specifications, necessary in all point-trading models, consist of the representative shipping or receiving points and the unit costs of transferring the commodity from each surplus to every deficit region. Boundaries of surplus and deficit regions may be delineated during preparation of input data for the transportation models, but such boundaries are not necessary.

Equilibrium solution for the transportation model requires that the

³ D. O. Hammerberg, L. W. Parker, and R. G. Bressler, Jr., *Supply and Price Interrelationships for Fluid Milk Markets*, Storrs Agr. Expt. Sta. Bull. 237, U. of Conn., Storrs, 1942; W. Bredo and A. S. Rojko, *Prices and Milksheds of Northeastern Markets*, U. of Mass. Agr. Expt. Sta. Bull. 470, Amherst, 1952.

TABLE 1. SIX REGION SINGLE-DIMENSION MODEL (SPACE)

Exporting regions	1a. Cost-flow matrix				1b. Equilibrium cost matrix				1c. Cost of non-opt. routes		
	Importing region			Surplus (S_i)	Importing region			U_i^1	Importing region		
	New England	South Atlantic	California		New England	South Atlantic	Calif.		New England	South Atlantic	Calif.
	(\$ per cwt.)			(Phys. units)	(\$ per cwt.)				(\$ per cwt.)		
Minn.	2.70	3.20	4.00 (8.6) ²	8.6	1.75	2.20	4.00	.00	.95	1.00	.00
Wis.	2.25 (1.0)	2.70 (8.0)	4.50 (6.4)	16.0	2.25	2.70	4.50	.50	.00	.00	.00
N. Y.	0.55 (3.4)	2.60	8.00	3.4	0.55	1.00	2.80	-1.20	.00	1.60	5.20
Deficit (D_j)	5.0	(Physical units) 8.0		28.0	V_j^3 1.75	2.20	4.00	—	—	—	—

¹ Producer price differentials.² Numbers in bold face type are optimum allocations of supplies in physical units.³ Consumer price differentials.

market be cleared with minimum total outlay for transfer costs. Selection of an optimum pattern of interregional commodity movement is the original "transportation problem" in linear programming and can be efficiently performed with a procedure developed by Dantzig.⁴ Space permits almost no discussion of computing procedures in this paper; excellent explanations are generally available.⁵ The minimum-cost commodity movement pattern is of interest primarily because it is the one that would tend to evolve in a competitive market.⁶

Transportation models in one dimension: Space models

An example of a transportation model and its equilibrium solution is provided in Table 1 as an aid in appraising the capabilities of the model. In this example, interregional commodity transfer costs are composed only of transportation costs; the commodity is transferred in the single dimension of space. Section 1a specifies transportation costs per hundred-weight of milk for shipments from each exporting region to each importing region. Quantities to be exported are listed in the fourth column of section 1a, and quantities to be imported are listed in the fourth row. Num-

⁴G. B. Dantzig, in *Activity Analysis of Production and Allocation*, T. C. Koopmans, ed., Cowles Commission Monograph No. 13, New York: John Wiley and Sons, 1951.

⁵For descriptions of hand computations and logic of the procedure, see A. Henderson and R. Schlaifer, "Mathematical Programming: Better Information for Better Decision Making," *Harvard Business Rev.*, Vol. 32, May-June, 1954; also, R. Dorfman, P. A. Samuelson and R. M. Solow, *Linear Programming and Economic Analysis*, McGraw-Hill, New York, 1958. For machine computation using the IBM 650, see S. Poley, *Transportation Problem*, IBM 650 Program Library File No. 10.1.003, International Business Machines, 590 Madison Avenue, New York City.

⁶P. A. Samuelson, "Spatial Price Equilibrium and Linear Programming," *Amer. Econ. Rev.*, Vol. 42, June, 1952.

bers in parentheses represent the optimum allocation of available supplies. The optimum allocation is the first item of information provided by the transportation model; it links particular shipping points to particular receiving points and lists the quantities moving on each route.

Section 1b of Table 1 is developed by entering unit costs of moving the product on the optimum routings of the equilibrium solution in the appropriate cells (shown in bold face type). The border column labeled U_i and the border row labeled V_j are developed by using the rule that any pair of one U_i and one V_j must sum to the transportation costs at the intersection of the row and column in question. The initial value of zero is inserted in the border cell corresponding to the surplus region selected as a base for determining price differentials (in the example, Minnesota) and the remaining border values are developed in succession (in the example, the border value for California would be entered after insertion of the zero value for Minnesota, then the value for Wisconsin would be entered, etc.). Next, values not boldface in the body of the matrix are entered; each cell is the sum of the corresponding pair of border values.

Intermarket price differentials, relative to price in the base region, are obtained by reversing the signs of all values in the border corresponding to the export regions. In the example, the Wisconsin price is \$0.50 lower than the price in Minnesota, while the New York price is \$1.20 higher. These differentials are advantages or disadvantages of shipper locations, compared to shippers in the base regions. On the border corresponding to the import regions, the values indicate amounts by which first receivers' prices at various locations differ from the price in the base region. A change of base region is easily made; add some value to every U_i and V_j cell such that the value in the border cell corresponding to the new base region becomes zero.

Section 1c is developed by subtracting each of the cell values in section 1b from the corresponding transportation cost in section 1a and entering the results in the same array used for the first two sections. The cells in section 1c contain costs that would have to be shared between buyer-seller pairs as a condition of making shipments along the indicated routes and foregoing the trading opportunities indicated by the optimum solution. Alternatively, these "opportunity costs" are savings to be shared between the buyers and sellers as shipments on the indicated routes are discontinued and trading is diverted to routes for which opportunity costs are zero.

Section 1c of a transportation model may have forecasting power of great interest to businessmen. Many commodity markets are characterized by regular trading among buyer-seller pairings with a minimum of day-to-

day negotiation. Such trading continues until one of the parties to a pairing becomes convinced that a firm in another market can offer better terms of trade over the long run. Transitory opportunities to trade on better terms are ignored by parties to a market pairing; long run considerations are dominant. Normal price fluctuations may for a time conceal secular changes in intermarket price relationships. If so, adjustments in inter-regional shipping patterns will lag behind changes in regional consumption and production levels. In such instances, the transportation model can indicate the likely direction of future adjustments to existing market conditions.

The transportation model and comparative statics

Even when large numbers of regions are involved, equilibrium solutions for a transportation model can be obtained at reasonable computing costs by using high-speed digital computers.⁷ Because solutions for individual problems are readily obtained, the transportation model is well suited to employment in comparative statics analyses. For example, trends in regional production and consumption can be followed through time with solutions computed at desired intervals. Such studies provide valuable insights about the interrelationships of markets during change in supply and demand conditions. This use of the transportation model is exemplified in a study of secular changes in the national broiler market by Henry and Bishop, a study of secular changes in the egg market by Stemberger, and three studies of seasonal changes in markets for highly perishable fresh vegetables by Farris, Droge, and Nichols.⁸

By the method of comparative statics, the transportation model becomes a valuable tool in studying economic effects of secular changes in regional production and consumption levels, changes in natural phenomena affecting production levels (drouths, floods, insect plagues, plant diseases, etc.), imposition of duties, introduction of subsidies, blocking of trade on particular routes, and changes in transport costs on particular routes.

⁷The Poley program for the IBM 650 computer permits solutions for problems as large as 340 shipping points and 99 receiving points. Computers larger than the IBM 650 will become available to many researchers during the next few years.

⁸W. R. Henry and C. E. Bishop, *North Carolina Broilers in Interregional Competition*, A. E. Inf. Ser. 59, Dept. of Agr. Econ., N.C. State Coll. Raleigh, February, 1957; A. P. Stemberger, "Evaluating the Competitive Position of North Carolina Eggs by Use of the Transportation Model," *J. Farm Econ.*, Vol. 41, Nov., 1959; D. E. Farris, *Interregional Competition in Fresh Vegetables*, unpub. Ph.D. diss., N.C. State Coll. Libr., Raleigh, 1958; J. H. Droge, *Interregional Competition in Marketing Early Commercial Irish Potatoes*, unpub. M.S. thesis, N.C. State Coll. Libr., Raleigh, 1958; T. E. Nichols, *North Carolina's Competitive Position in the Marketing of Snap Beans and Cabbage*, unpub. M.S. thesis, N.C. State Coll. Libr., Raleigh, 1959.

Supplementing information from a transportation model with information from side analyses

Information from transportation models may be enhanced in usefulness if it is combined with other information in side analyses. Location advantages or disadvantages of shippers in the various supply regions do not usually pass intact to raw material suppliers; differentials in processing or manufacturing costs may either offset or enhance the effects of location. Here is opportunity to utilize information gained from studies of economies of scale, economies of concentration, and differentials in regional costs of factors used for processing or manufacturing. By summing production cost differentials and location advantages, with due regard to sign and using the same base region throughout, differentials in net returns to raw material suppliers in the various regions may be obtained. The resulting information has implications for growth or decline of the industry in various locations. This use of the transportation model is exemplified in a North Carolina study of competition among broiler producing areas.⁹

Similarly, information from transportation models could be used in margins studies. Differences between prices paid by consumers and those received by farmers are partially explained by the location of consumers relative to location of their best sources of supplies. The transportation model effectively isolates contributions of transportation costs to farm-to-consumer margins for the various markets. Processing and distribution costs can be added in side analyses to determine minimum margins consistent with competitive equilibria. Compared to margins in the actual commodity market, such studies could provide indications of inefficiencies and/or the absence of effective competition in various sectors of the commodity market.

In working with a single-dimension transportation model, information about costs of production, processing, and intramarket distribution costs is easier to handle and more meaningful if it is used in side analyses. However, such costs may be added to transportation costs, prior to computation of a solution for the single-commodity model, without affecting the optimum pattern of interregional shipments. For example, suppose regional production costs had been added to transportation costs for all shipments leaving the exporting regions in section 1a of Table 1. In effect, a constant (total production costs) has been added to the sum to be minimized; the larger sum cannot be minimized except by choosing the same optimal interregional shipping plan as before. The U'_4 column in section

⁹ W. R. Henry, "Broiler Production Regions of the Future," *J. Farm Econ.*, Vol. 39, Dec., 1957.

1b would be changed, however; surplus region price differentials from price in the base surplus region would be displaced either upward or downward by the difference between their production costs and production costs in the base region. Note that optimum routings remain unaffected by the addition of production costs.

Similar reasoning applies to the addition of intramarket distribution costs for all shipments arriving at deficit regions. The only effect would be a displacement of the values in the V_i row of section 1b; with a surplus region as the base region, the price differentials for the importing regions would be displaced upward by the full amount of the marketing charges added. Ordinarily, initial examination of relations of the border values to the value for a single base region is helpful in interpreting the results. However, the difference between any pair of border values is the difference between the equilibrium prices at the two points in question.

Multiple-dimension transportation models: Space-form, space-time, and space-form-time models

At this point, we note that in competitive markets transportation costs set upper limits to separation of commodity prices in the spatial dimension, storage costs set upper limits to separation of commodity prices in the time dimension, and other marketing charges set upper limits to separation of commodity prices by levels of production and marketing (i.e., in the dimension of form).

The transportation model described above is a single-dimension model because shipping and receiving points are separated from each other in the single dimension of space. In multiple-dimension models, shipping and/or receiving points are also separated in the dimensions of form or time or both. Transfer costs of multiple-dimension models contain other marketing charges in addition to transportation costs. The costs of transportation may depend upon the form into which a commodity is processed or the time at which it is shipped. Multiple-dimension models can simultaneously determine optimum combinations of locations of processing and/or storage facilities and interregional commodity movement patterns.

A space-form model

To illustrate a two-dimension transportation model, the fluid milk example is modified as shown in Table 2. Surplus quantities are those of Table 1, but these may be moved to market in either conventional or concentrated form. Producers are indifferent as to the form in which the milk is sold, since the competitive market equalizes net returns after deduction of processing costs. Consumers regard the two forms as different

TABLE 2. SIX REGION TWO-DIMENSION MODEL (SPACE-FORM)

Exporting region	Importing region and form of commodity						Surplus (S_i)
	New England		South Atlantic		California		
	Convent.	Concent.	Convent.	Concent.	Convent.	Concent.	
2a. Cost-flow matrix							
	(\$ per cwt.)						(Phys. units)
Minn.	2.70	0.50	3.20	0.54	4.00 (7.5) ¹	0.60 (1.1)	8.6
Wis.	2.25	0.46 (1.6)	2.70 (4.0)	0.52 (4.0)	4.50	0.63 (6.4)	16.0
N. Y.	0.55 (2.5)	0.30 (0.9)	2.60	0.45	8.00	0.75	3.4
(Physical units)							
Deficit (D_i)	2.5	2.5	4.0	4.0	7.5	7.5	28.0
2b. Equilibrium cost matrix							
	(\$ per cwt.)						U_i ²
Minn.	.68	.43	2.67	.49	4.00	.60	.00
Wis.	.71	.46	2.70	.52	4.03	.63	.03
N. Y.	.55	.30	2.54	.36	3.87	.47	-.13
V_i ³	.68	.43	2.67	.49	4.00	.60	—
2c. Cost of using non-optimum routes							
	(\$ per cwt.)						
Minn.	2.02	.07	.53	.05	.00	.00	
Wis.	1.54	.00	.00	.00	.47	.00	
N. Y.	.00	.00	.06	.09	4.13	.28	

¹ Numbers in boldface type are optimum supply allocations in physical units.² Producer price differentials.³ Consumer price differentials.

products. Requirements for each of the two forms are known for each of the receiving points. There is variation among surplus regions in costs of processing milk into the concentrated form and in the proportion by which costs of transporting are reduced. Transfer costs for the concentrated form consist of the sum of cost of processing and cost of transportation.

Examination of the flow matrix in section 2a of Table 2 shows that the equilibrium solution contains a new item of information; by summing quantities in the columns labeled "concentrated," the investigator obtains an estimate of the processing capacity needed in each surplus region with the market in equilibrium. Snodgrass and French have made use of a space-form transportation model to determine optimum locations of

TABLE 3. SIX REGION TWO-DIMENSION MODEL (SPACE-TIME)

Exporting region	Importing region and time of consumption						Surplus (S_i)
	New England		South Atlantic		California		
	Period 1	Period 2	Period 1	Period 2	Period 1	Period 2	
2a. Cost-flow matrix							
			(\$ per cwt.)				(Phys. units)
Minn.	2.70	2.80	3.20	3.25	4.00 (7.5) ¹	4.20 (1.1)	8.6
Wis.	2.25	2.30 (1.6)	2.70 (4.0)	2.80 (4.0)	4.50	4.55 (6.4)	16.0
N. Y.	0.55 (2.5)	0.65 (0.9)	2.60	2.65	8.00	8.30	3.4
(Physical units)							
Deficit D_i	2.5	2.5	4.0	4.0	7.5	7.5	28.0
2b. Equilibrium cost matrix							
			(\$ per cwt.)				$U_i^{1/2}$
Minn.	1.85	1.95	2.35	2.45	4.00	4.20	.00
Wis.	1.55	2.30	2.70	2.80	4.35	4.55	.35
N. Y.	0.55	0.65	1.05	1.15	2.70	2.90	-1.30
V_i^3	1.85	1.95	2.35	2.45	4.00	4.20	
2c. Cost of using non-optimum routes							
			(\$ per cwt.)				
Minn.	0.85	.85	.85	.80	.00	.00	
Wis.	0.70	.00	.00	.00	.15	.00	
N. Y.	.00	.00	1.55	1.50	5.30	5.40	

¹ Numbers in boldface type are optimum allocations of supplies, in physical units.² Producer price differentials.³ Consumer price differentials.

processing facilities in a study of the national dairy products market.¹⁰ Simmons has made a similar study of dairy products markets in the Western region. In Simmons' study, processing costs are adjusted and new solutions are computed to bring processing cost-capacity combinations in line with relationships from studies of economies of scale in dairy product processing plants.¹¹

¹⁰ M. M. Snodgrass and C. E. French, *Linear Programming Approach to the Study of Interregional Competition in Dairying*, Sta. Bull. 637, Purdue U., Lafayette, Indiana, May 1958.

¹¹ R. L. Simmons, *Optimum Adjustments of the Dairy Industry of the Western Region to Economic Conditions of 1975*, unpub. Ph.D. diss., U. of Calif. Libr., Berkeley, 1959.

Other multiple-dimension models

In order to illustrate a space-time model, the fluid milk example is modified as shown in Table 3. Surplus quantities are still unchanged, but can be moved to market in either of two time periods. Producers develop the surplus in the first time period and are indifferent as to the time period in which it is sold, since the competitive market equalizes net returns after deduction of storage costs. Requirements for each of the two time periods are known for each of the receiving points. There is variation among the surplus regions in costs of sterilizing milk and storing it until the second time period and in the effects upon transportation costs of putting the milk into sterile form. Transfer costs for the second period consist of the sum of costs of sterilizing and storage and the costs of transportation.

TABLE 4. FOUR-REGION SPACE-FORM TRANSPORTATION MODEL TRANSFORMED TO GENERAL LINEAR PROGRAMMING FORMAT

Conditions	Minn. to N.E.		Minn. to Cal.		Wisc. to N.E.		Wisc. to Cal.		Constraint
	Table	Mfg.	Table	Mfg.	Table	Mfg.	Table	Mfg.	
Demand:									
1. N.E. table	1				1				$\geq r_1 = 2.5$
2. N.E. mfg.		1				1			$\geq r_2 = 2.5$
3. Cal. table			1				1		$\geq r_3 = 7.5$
4. Cal. mfg.				1				1	$\geq r_4 = 7.5$
Supply:									
5. Minn.	-1	-1	-1	-1					$\geq -k_1 = 12$
6. Wisc.					-1	-1	-1	-1	$\geq -k_2 = 8$
c_{ij}	2.70	.50	4.00	.60	2.25	.46	4.50	.63	= minimum

The flow matrix of section 3a again contains a new item of information. By summing quantities in the columns labeled "period 2," the investigator obtains an estimate of the storage capacity needed in each of the surplus regions with the market in equilibrium. The authors of this paper did not find any empirical studies in which space-time or space-form-time transportation models have been used.

The Generalized Transportation Model

Dorfman, Samuelson, and Solow have described the transformation of a transportation problem into a general linear programming problem.¹² This transformation puts the transportation model into a new format and gives a remarkable increase in the capabilities of the model.

Table 4 shows the format of a space-form transportation model transformed into a general linear programming problem. Again, milk is used

¹² Dorfman, *et al.*, *op. cit.*

as an example. For simplicity, only two surplus regions, two deficit regions, and two forms of the commodity are used. As before, consumers regard the two forms as different products, and the requirements for each of the forms are known for each of the deficit regions. Producers are indifferent as to the form in which the commodity is shipped. Lines (1) through (4) impose the restrictions that each deficit region must receive at least as much as its requirement of each of the forms of the commodity. Line (5) and (6) impose the restriction that no surplus region can ship more than the quantities in excess of local requirements.

TABLE 5. EXAMPLE OF APPLICATION OF TRANSPORTATION MODEL IN GENERAL LINEAR PROGRAMMING FORM

Conditions	Minnesota to New England			Minnesota to California			...	Wisc. to Cal.	Constraint
	Fl as T	Fl as M	M as M	Fl as T	Fl as M	M as M		M as M	
	(1)	(2)	(3)	(4)	(5)	(6)		(12)	
Demand:									
1. N.E. table	1								$\geq r_1 = 2.5$
2. N.E. mfg.		1	1						$\geq r_2 = 2.5$
3. Cal. table				1					$\geq r_3 = 7.5$
4. Cal. mfg.					1	1	...	1	$\geq r_4 = 7.5$
Supply:									
5. Minn. fl.	-1	-1		-1	-1				$\geq -k_{11} = 7$
(6.) Minn. mfg.		-1	-1		-1	-1			$\geq -k_{12} = 5 + ?$
7. Minn. f+m	-1	-1	-1	-1	-1	-1			$-k_1 = 12$
8. Wisc. fluid							...		$\geq -k_{21} = 6$
(9.) Wisc. mfg.								-1	$\geq -k_{22} = 2 + ?$
10. Wisc. f+m								-1	$-k_2 = 8$
c_{ij}	2.70	.50	.50	4.00	.60	.6063	= minimum

Because the total deficit is equal to the total surplus, the inequality signs in the restrictive equations cannot be effective. Since the equalities must apply, the restrictions have exactly the same effect upon the solution as do the border values in the flow matrix of a transportation problem. The above transformation of the problem applies to its form rather than its substance; it has the same solution(s) whether it is in the general linear programming form or the transportation problem form. So far, transformation of the transportation problem seems a negative accomplishment; computation of a solution is more difficult.

The milk example in Table 5 illustrates increased power of the transportation model in its general form. The problem is similar to that in Table 4, but requirements for table milk cannot be satisfied except from supplies of fluid (high grade) milk, while requirements for manufacturing

milk can be satisfied from supplies of either fluid or manufacturing (lower grade) milk. Further, total supplies of fluid milk exceed requirements for table milk.

A difficulty arises in attempting to enter restriction (6) in Table 5. The maximum quantity of manufacturing milk that can be supplied by Minnesota consists of the total amount produced as manufacturing milk plus an unknown amount of higher grade fluid milk; this amount is to be determined by the solution of the problem. The difficulty is overcome by substituting restriction (7); this restriction limits total supplies of milk from Minnesota, while restriction (5) limits total supplies of fluid. Restrictions (5) and (7) are linearly independent; solution by linear programming is straightforward. Some of the inequalities of Table 5 may be effective in a solution for this problem; equilibrium cannot be determined by solving a "transportation problem"; the general linear programming procedure is necessary.

A Spatial Equilibrium Model Using Step Functions— Solution as a Transportation Problem

Samuelson's 1952 paper describes some of the formal properties of a single-commodity, point-trading, spatial equilibrium model.¹³ Supply and demand quantities in each of the regions are considered to be functions of prices at the points representing the regions. In each region, the supply quantity at each price is subtracted from the demand quantity at that price to develop an "excess supply" function. At some price, the region will produce exactly the amount it consumes; above this break-even price, the excess supply function describes quantities the region is willing to produce for export at the various prices; below the break-even price, the function describes quantities the region is willing to take as imports at the various prices. Samuelson diagrams the equilibrium of a two-region case with transport costs considered, demonstrates that equilibrium necessitates maximization of "social pay-off," and extends the theory to an n -region case. This model has been used in three empirical studies by Fox, Judge, and Judge and Wallace.¹⁴

Maximization of net social pay-off, as proposed by Samuelson, has involved tedious procedure if numerous regions were involved and excess

¹³ Samuelson, *op. cit.*

¹⁴ K. A. Fox, "A Spatial Equilibrium Model of the Livestock-Feed Economy in the United States," *Econometrica*, Vol. 21, pp. 547-66, 1952; G. C. Judge, *Competitive Position of the Connecticut Poultry Industry—A Spatial Equilibrium Model for Eggs*, Bulletin 318, Storrs (Conn.) Agr. Expt. Sta., 1956; G. C. Judge and T. D. Wallace, *Spatial Price Equilibrium Analyses of the Livestock Economy—I. Methodological Development and Annual Spatial Analyses of the Beef Marketing Sector*, Tech. Bul. 78, Okla. Agr. Expt. Sta., June, 1959.

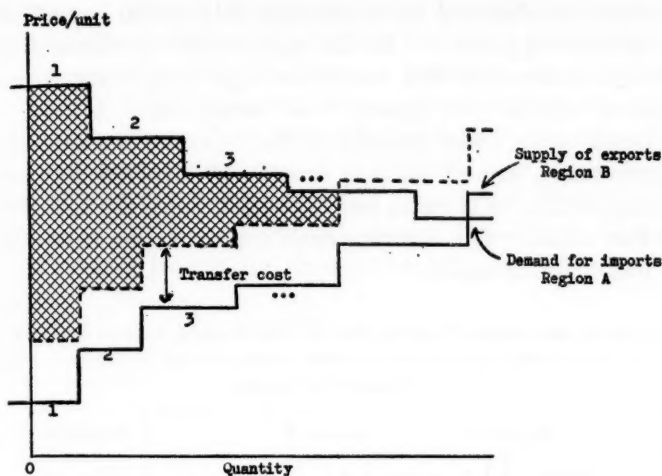


FIGURE 1. A SINGLE-COMMODITY, POINT-TRADING, SPATIAL EQUILIBRIUM MODEL USING STEP TRADING FUNCTIONS

supply functions were taken to be continuous. We propose to approximate the excess supply functions as step functions in order to turn maximization of net social pay-off into the transportation problem of linear programming. Solution becomes feasible, even with numerous regions involved, making this very powerful model much more manageable for empirical studies.

Figure 1 shows the maximization of social pay-off in equilibrium of a two-region case. Excess supply functions are stepped. Social pay-off is the shaded area in the figure. Note that movement of one unit of the commodity from any step of a supply-of-exports function to any step of a demand-for-imports function results in a social transfer gain equal to the price the importing region will pay at the corresponding demand step, less the sum of the transportation costs per unit and the price that the exporting region is willing to accept at the corresponding supply step. Total social pay-off is the summation of units transferred times social transfer gain per unit. This summation is what we wish to maximize.

In order to compute the equilibrium solution for an n -region model, a social pay-off matrix is formed as in Table 6. Social transfer gains, computed as described above, are entered in the appropriate cells. Any social transfer gain computed to be zero or negative is entered as zero. Any border value of the flow matrix consists of the quantity in the corresponding step of the export or import function. Total demand is easily equalized to total supply, since the quantities entered from the right extremes of the functions can be arbitrary.

The solution is obtained by maximizing total social pay-off, using the linear programming procedure for the transportation problem. Any quantities moving in cells of the flow matrix corresponding to zero values in the social pay-off matrix are regarded as "nonexistent." If any "existent" transfer involves the entire amount in the right-most or left-most step(s) of any function(s), extend the step function(s) involved and recompute. By reducing widths of steps in successive solutions, the investigator can obtain a final solution that is a very close approximation to equilibrium of a continuous function model.¹⁵

TABLE 6. ARRAY FOR SOCIAL PAY-OFF MATRIX AND BORDER VALUES OF FLOW MATRIX

Supply of exports	Demand for imports					Total supply
	Region A		Region B	...	Region X	
	Steps	1 2 ... n	1 2 ... n	...	1 2 ... n	
Region A	1					
	2					
	.					
	.					
	n					
Region B	1			...		
	2					
	.					
	.					
	n					
.		
.	.					
.	.					
Region X	1					
	2					
	.					
	.					
	n					
Total demand				...		Grand total: demand and supply

The above spatial equilibrium model can be set up to embrace transfers of the commodity in any two or all three of the commodity dimensions of space, form, and time. All transfer costs are subtracted from gross difference between supply price and demand price to obtain net social transfer gain per unit moved from a supply step to a demand step. If volume affects

¹⁵ T. E. Tramel and A. D. Seale, Jr. present in the paper that follows an alternative procedure for solving the model under discussion.

transportation, processing, or storage costs, the relationship(s) may be easily incorporated in the model. Transfer costs may be increased or decreased in moving from step to step on a particular supply (or demand) function. If the investigator wishes to use completely inelastic demand or supply functions, he may do so. If supply functions and demand functions are both considered to be completely inelastic, the model becomes a transportation model. Thus, the spatial equilibrium model has all the analytical power of the transportation model. In addition, it allows the investigator to enter supply and demand as variables dependent on commodity price.

REACTIVE PROGRAMMING OF SUPPLY AND DEMAND RELATIONS—APPLICATIONS TO FRESH VEGETABLES*

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SINCE "Reactive Programming" is a new term, coined to describe to some extent the process employed, we may well spend a few minutes in learning something about the technique. Then we will move on to one of several applications which have been made. We will define Reactive Programming as a means of obtaining the equilibrium flows of a commodity between areas with given transportation cost functions, given demand schedules in each of the several areas of consumption and given supply schedules in each of the several areas of production.

Though the technique is by no means limited to the case considered in this paper, we limit ourselves here to the problem of determining the perfect competition equilibrium flows of a commodity between areas with given demand schedules in each of several areas of consumption, fixed supplies in each of several areas of production, and given constant unit transportation costs. We apologize for the necessity of employing a good many symbols with subscripts and superscripts. But, their use is required for an orderly presentation of the technique.

First, we let $i=1, 2, \dots, m$ denote the different producing areas and $j=1, 2, \dots, n$ denote the different consuming areas. Next, we let P_j denote price of the homogeneous product in the j th consuming area, Q_{ij} denote quantity purchased in the j th consuming area which was produced in the i th producing area, T_{ij} denote the constant unit cost of transporting the product from the i th producing area to the j th consuming area, S_i denote the fixed supply in the i th producing area, and R_{ij} denote the "net" average revenue per unit for the product produced in the i th producing area and sold in the j th consuming area. Since an iterative procedure is used, we use the superscript (k) to denote the variables Q_{ij} being solved for at any stage of the process and the superscript $(k-1)$ to denote the last values obtained for all Q_{ij} 's prior to solving for the variables in question.

As given data for the problem we must have the n demand equations,¹

$$(1) \quad P_j = F_j \left(\sum_{i=1}^m Q_{ij} \right), \quad j = 1, 2, \dots, n,$$

* Journal Paper No. 798 of the Mississippi Agricultural Experiment Station.

** The authors wish to express appreciation to our colleague, Mr. Fred Davis, Director of the Mississippi State University Computing Center, for making computing facilities available during the development of this technique and for developing some of the "short-cuts" now employed in computations.

¹ Preference for the product from a given producing area by any or all consuming areas can be handled by expanding equation (1) to a separate demand equation for the product from each producing area.

the $m \times n$ T_{ij} 's, and the m S_i 's. From the given data, $m \times n$ equations,²

$$(2) R_{ij} = F_j \left(\sum_{i=1}^m Q_{ij} \right) - T_{ij}, i = 1, 2, \dots, m, j = 1, 2, \dots, n,$$

may be formed. Each of the $m \times n$ equations (2) defines for each producing area the net price which can be obtained in each consuming area. Thus a solution to our problem is a solution to the $m \times n$ equations (2) under the following restrictions:

- (a) All $Q_{ij} \geq 0$.
- (b) For given i , all R_{ij} 's are equal for all j 's to which shipments are made, and in turn are greater than all R_{ij} 's for all j 's to which shipments are not made.
- (c) $R_{ij} \geq 0$ for all i 's and all j 's between which the commodity flows.
- (d) $\sum_{j=1}^n Q_{ij} \leq S_i$.

One procedure which may be used to obtain the desired solution is as follows:³

1. Assign arbitrary values ≥ 0 to all Q_{ij} 's making sure that

$$\sum_{j=1}^n Q_{ij} = S_i.$$

(These arbitrary values are taken as the values of the Q_{ij} 's for the $(k-1)$ th iteration.)

2. Set $i = 1$.
3. For the given i , set all $^{(k)}Q_{ij}$'s equal to one,⁴ and form the n equations,

$$R_{ij} = F_j \left[\sum_{i=1}^m {}^{(k-1)}Q_{ij} - {}^{(k-1)}Q_{ij} + {}^{(k)}Q_{ij} \right] - T_{ij}, j = 1, 2, \dots, n.$$

² If transportation charges are not constant but functionally related to volume, T_{ij} becomes a function. If supplies are not fixed, production costs, constants or functions, may also be included in equation (2) and with the S_i 's set equal to extremely large numbers for calculation purposes the procedure outlined later yields the quantities which will be produced in each area and the equilibrium flows. For forms of competition other than perfect, the appropriate "marginals" must be substituted for the "averages."

³ A faster alternative procedure which may be used if supplies are not fixed and production is to be determined as a part of the problem, is to set equation (2) equal to zero and solve directly for the corresponding Q_{ij} letting $j = 1, 2, \dots, n$ and $i = 1, 2, \dots, m$ and reiterating. Zeros are substituted for all negative Q_{ij} 's and the last values obtained are used for all Q_{ij} except the one being solved for.

⁴ For forms of competition other than perfect, setting all $^{(k)}Q_{ij}$'s equal to .5 and the corresponding change in step 6 of

$$\sum_{j=1}^n {}^{(k)}Q_{ij} = S_i + .5n$$

yields a more accurate solution.

4. Evaluate all R_{ij} 's for the given i and select the largest. In case of tie for the largest, select either.
5. Check whether the R_{ij} selected under step 4 is ≥ 0 . If not, reduce all $^{(k)}Q_{ij}$'s for the given i by one and perform step 7. If so, increase the corresponding $^{(k)}Q_{ij}$ by one.⁵
6. Check whether

$$\sum_{j=1}^n {}^{(k)}Q_{ij} = S_i + n.$$

If not, repeat steps 4 and 5. If so, reduce all $^{(k)}Q_{ij}$'s for the given i by one and perform the check indicated under step 7.

7. Check whether $i=m$. If not, increase i by one and repeat steps 3, 4, 5, and 6. If so, perform the check indicated under step 8.
8. Check whether all Q_{ij} 's have the same values as for the preceding iteration. If not, repeat steps 2, 3, 4, 5, 6, and 7. If so, the equilibrium quantities have been obtained.

Let us now work through a simple example to demonstrate. We will assume two producing areas and three consuming areas. Prices in each consuming area are assumed to be defined by:

$$\begin{aligned} P_1 &= \$50 - \$2 \sum_{i=1}^2 Q_{i1}, \\ P_2 &= \$60 - \$3 \sum_{i=1}^2 Q_{i2}, \text{ and} \\ P_3 &= \$55 - \$2 \sum_{i=1}^2 Q_{i3}. \end{aligned} \quad (1a)$$

Transportation costs are assumed to be:

$$\begin{aligned} T_{11} &= \$1, & T_{12} &= \$4, & T_{13} &= \$6, \\ T_{21} &= \$8, & T_{22} &= \$2, & \text{and} & T_{23} &= \$3. \end{aligned}$$

Fixed supplies are assumed to be:

$$S_1 = 6 \quad \text{and} \quad S_2 = 8.$$

Following the procedure outlined, for step 1 the arbitrary initial allocation is assumed to be:

$$\begin{aligned} Q_{11} &= 2, & Q_{12} &= 2, & Q_{13} &= 2, \\ Q_{21} &= 2, & Q_{22} &= 2, & \text{and} & Q_{23} &= 4. \end{aligned}$$

For step 2, i is set equal to 1.

⁵ Restrictions other than predetermined supplies may be incorporated at this point. If none of the restrictions are violated by the indicated assignment, no change of procedure is necessary. If the indicated assignment does violate one or more of the added restrictions, select the next highest R_{ij} and repeat step 5 which would now include checking against the added restrictions.

For step 3, the following three equations are formed:

$$R_{11} = \$50$$

$$- \$2 \left[\left(\sum_{i=1}^2 (k-1) Q_{i1} = 4 \right) - ((k-1) Q_{11} = 2) + ((k) Q_{11} = 1) \right] - \$1$$

$$(2a) R_{12} = \$60$$

$$- \$3 \left[\left(\sum_{i=1}^2 (k-1) Q_{i2} = 4 \right) - ((k-1) Q_{12} = 2) + ((k) Q_{12} = 1) \right] - \$4$$

$$R_{13} = \$55$$

$$- \$2 \left[\left(\sum_{i=1}^2 (k-1) Q_{i3} = 6 \right) - ((k-1) Q_{13} = 2) + ((k) Q_{13} = 1) \right] - \$6$$

For step 4, evaluation of each of the three equations yields: $R_{11} = \$43$, $R_{12} = \$47$, and $R_{13} = \$39$. Thus we select R_{12} .

For step 5, \$47 is greater than zero. Hence $(k) Q_{12}$ is increased by one.

For step 6,

$$\sum_{j=1}^3 (k) Q_{ij} = 1 + 2 + 1 = 4$$

which is less than $6 + 3 = 9$. Thus we return to step 4.

Execution of step 4 this time results in $R_{11} = \$43$, $R_{12} = \$44$, and $R_{13} = \$39$ and the selection of R_{12} again as the largest. Continuation of the steps outlined until the equality in step 6 is satisfied and the subsequent reduction of all $(k) Q_{1j}$'s by one yield the values of Q_{11} , Q_{12} , and Q_{13} indicated under "iteration 1" in Table 1.

TABLE 1. SUCCESSIVE APPROXIMATIONS TO EQUILIBRIUM FLOWS FOR THE HYPOTHETICAL PROBLEM

Variable	Initial approximation	Iteration		
		1	2	3
Q_{11}	2	2	4	4
Q_{12}	2	3	2	2
Q_{13}	2	1	0	0
Q_{21}	2	0	0	0
Q_{22}	2	3	3	3
Q_{23}	4	5	5	5

The check under step 7 indicates that $i \neq m$. Thus our procedure now calls for setting $i = 2$ under step 2, and for step 3 forming the three equations below:

$$R_{21} = \$50 - \$2$$

$$\left[\left(\sum_{i=1}^2 (k-1) Q_{i1} = 4 \right) - ((k-1) Q_{21} = 2) + ((k) Q_{21} = 1) \right] - \$8$$

$$(2b) \quad R_{22} = \$60 - \$3$$

$$\left[\left(\sum_{i=1}^2 ({}^{(k-1)}Q_{i2} = 5 \right) - ({}^{(k-1)}Q_{22} = 2) + ({}^{(k)}Q_{22} = 1) \right] - \$2$$

$$R_{23} = \$55 - \$2$$

$$\left[\left(\sum_{i=1}^2 ({}^{(k-1)}Q_{i3} = 5 \right) - ({}^{(k-1)}Q_{23} = 4) + ({}^{(k)}Q_{23} = 1) \right] - \$2$$

Evaluation of equations (2b) for step 4 yields $R_{21} = \$36$, $R_{22} = \$46$, and $R_{23} = \$49$. Thus R_{23} is selected as the largest.

For step 5, \$49 is greater than zero. Hence ${}^{(k)}Q_{23}$ is increased by one.

For step 6,

$$\sum_{j=1}^3 ({}^{(k)}Q_{2j} = 1 + 1 + 2 = 4$$

which is less than $8+3=11$. Thus we return to step 4.

When step 4 is executed this time, $R_{21} = \$36$, $R_{22} = \$46$ and $R_{23} = \$47$ and R_{23} is again selected as the largest. Continuation of the steps outlined until the equality in step 6 is satisfied, and the subsequent reduction of all ${}^{(k)}Q_{2j}$'s by one, yield the values of Q_{21} , Q_{22} , and Q_{23} indicated under "Iteration 1" in Table 1. The check under step 7 indicates that $i=m$. Thus the check indicated under step 8 is performed. Since all Q_{ij} 's do not have the same values as for the preceding iteration (the arbitrary initial approximation) we return to step 2. Continuation of the process until the check indicated under step 8 is satisfied results in the other values for the Q_{ij} 's presented in Table 1.

Now let's see if the solution obtained satisfied our restrictions. Restriction (a) is obviously satisfied. Evaluation of R_{ij} for the equilibrium quantities results in $R_{11} = \$41$, $R_{12} = \$41$, $R_{13} = \$39$, $R_{21} = \$34$, $R_{22} = \$43$, and $R_{23} = \$43$. Thus restriction (b) is satisfied. All R_{ij} 's are greater than zero. So, restriction (c) is obviously satisfied. Finally

$$\sum_{j=1}^3 Q_{1j} = 6 = S_1 \quad \text{and} \quad \sum_{j=1}^3 Q_{2j} = 8 = S_2.$$

Thus restriction (d) is satisfied and our solution has been found.⁶

At this point it may be well to note parenthetically that at each stage of the iteration each producing area has a chance to *react* to changes made by all other producing areas since the producing area in question was last considered. Hence the term "Reactive Programming" is descriptive of the technique. For forms of competition other than perfect, the term is even more descriptive.

⁶ Modification of the technique to handle procurement and mix problems where price depends on quantity should be obvious.

Another technique developed by Judge and Wallace⁷ is available for use with some of the problems of this nature. Also, King and Henry of North Carolina have a procedure for solving problems of this nature which was presented in this session.

Now let us turn to one of several applications made of the technique, a study of the competitive position of Mississippi in the production of watermelons.⁸

Time limitation will not permit details of the study. Let it suffice to say that the 1956 marketing season was broken down into 12 marketing periods and fixed supplies in each of 34 producing areas and receipts in 22 consuming areas, together with prices associated with the different quantities, were

TABLE 2. CONSTANTS¹ FOR REGRESSION EQUATIONS OF DEMAND FOR WATERMELONS IN 22 CONSUMING CENTERS

Consuming center	a	Consuming center	a
Atlanta	7.59468	Louisville	7.54787
Baltimore	7.73453	Minneapolis-St. Paul	7.69511
Birmingham	7.52097	New Orleans	7.58621
Boston	7.89080	New York	8.25850
Chicago	8.06062	Oakland-San Francisco	7.86435
Cincinnati	7.64288	Philadelphia	7.97077
Dallas-Ft. Worth	7.70621	Pittsburgh	7.83488
Denver	7.56914	Portland	7.58569
Detroit	7.93578	Seattle	7.57695
Jackson	7.21112	St. Louis	7.78863
Los Angeles	8.04769	Washington, D. C.	7.78679

¹ Values of a in the demand regressions

$$\log_e P = a - 0.28424 \log_e Q$$

where P is price in dollars per carlot and Q is demand in carlots, based on data for June 5-Aug. 31, 1956, and applicable to the period July 24-30, 1956.

tabulated from published data. Regression estimates of demand equations of the form,

$$(3) \quad \log P = a + b \log Q$$

where P denotes price and Q denotes quantity, were obtained for each consuming area for each marketing period. Regression estimates of transportation charges were obtained from data furnished by truck brokers. Brokerage, inspection and weighing fees were obtained from the General Manager of the Farmers Central Market, Jackson, Mississippi.

Results presented in this paper are for the marketing period July 24-July 30. Demand equations for that marketing period are presented in Table 2, marketing charges in Table 3, and the fixed supplies in Table 4.

⁷ Judge, G. G., and Wallace, T. D., "Spatial Price Equilibrium Analyses of the Livestock Economy," Dept. Agr. Econ., Okla. State U., Tech. Bull. TB-78, June, 1959.

⁸ Seale, A. D., Jr., and Allen, M. B., "Reactive Programming of Supply and Demand for Watermelons Produced in Mississippi and Competing Areas," A.Ec. Tech. Publ. No. 1, Miss. Agr. Expt. Sta., 1959.

Table 4 also shows equilibrium quantities received by each consuming area from each producing area and Table 5 the corresponding net prices (upper figure in each cell in each table), and equilibrium quantities and prices with the supply in Mississippi doubled (the lower figure in each cell).

It is interesting to note at this point that had we had the equilibrium quantities for each consuming area, the equilibrium flows could have been obtained by linear programming. Thus the power of Reactive Programming is demonstrated by the fact that it determines at one and the same time, the equilibrium quantities in each consuming area *and* the least-cost routes of providing these quantities from the fixed supplies in each of the several producing areas.

How does computing time for Reactive Programming compare with the time required for linear programming? By taking advantage of a short-cut in computations, i.e., for each producing area assign immediately to each consuming area all units which were assigned in the previous iteration except a number equal to the greatest change in assignments which occurred in the previous iteration, and by being satisfied with an approximate solution, i.e., considering the problem solved when changes in assignments from one iteration to the next do not exceed one unit, computing time averages about one and one-half hours with an IBM Type 650 per problem for problems having logarithmic demand functions and of the approximate size presented in this paper. Linear demand functions reduce computing time by some fifty to sixty percent. This is essentially the same computing time requirements as for linear programming. However, our experience indicates that if the calculations are carried to the point of no change from one iteration to the next, computing time will be perhaps doubled or tripled.⁹

Of what value is the information provided by Reactive Programming? Its usefulness is limited only by the imagination of the researcher and the availability of good basic data. It (or its equivalent) is the only means whereby the effect of changes in demand, supply, transportation charges, marketing costs, and institutional barriers can be evaluated.¹⁰ As an example we can determined from Table 6 the effect of the doubled quantity from Mississippi on prices in each consuming center; from Tables 4 and 5, the effect on net prices and returns above certain marketing costs in each producing area. As another example, in the study mentioned, the effect of having the Mississippi crop mature one week earlier was determined, giving horticulturists some idea of the value of developing means of maturing Mississippi watermelons earlier.

⁹ Problems ranging in size up to approximately 400 markets and an *unlimited* number of producing areas can be handled by an IBM Type 650; the IBM Type 704 should handle an unlimited number of producing areas and 10,000 or more markets.

¹⁰ Extension of the technique to provide solutions to problems involving joint equilibria for two or more products can perhaps be made.

Total	Consuming center														Producing area														Va.
	Ala.	Ariz.	Ark.	Calif.	Del.	Fla.	Ga.	Ind.	Md.	Miss.	Mo.	N. C.	N. J.	N. Mex.	Okla.	S. C.	Texas												
											</																		

¹ Under perfect competition equilibrium, using demand functions from Table 2. For the period July 24-30, 1956.
² Shipping routes used in equilibrium solutions. Failure of "net" prices in each consuming area to which a given producing area shipped under the equilibrium situations to be exactly the same results from assignments being based upon "net" price for the next unit in each instance and the discrete unit of one carlot being used. Though input data used in most instances probably will not justify the added calculations required, additional accuracy in the solution may be obtained by defining the "unit" in smaller terms.

TABLE 6. EQUILIBRIUM PRICES FOR WATERMELON QUANTITIES IN TABLE 4
AND DEMAND EQUATIONS IN TABLE 2

Consuming center	Actual supply from Mississippi	Doubled supply from Mississippi
	<i>(Dollars per carlot)</i>	
Atlanta	525	516
Baltimore	686	681
Birmingham	550	541
Boston	793	789
Chicago	726	717
Cincinnati	654	645
Dallas-Ft. Worth	506	497
Denver	737	730
Detroit	722	714
Jackson	563	520
Los Angeles	642	642
Louisville	643	635
Minneapolis-St. Paul	770	765
New Orleans	569	525
New York	736	731
Oakland-San Francisco	633	633
Philadelphia	711	706
Pittsburgh	720	712
Portland	808	808
Seattle	859	859
St. Louis	659	650
Washington, D. C.	675	670

Reactive Programming is, we believe, a powerful tool, applicable to many problems in interregional competition. On the other hand, indiscriminate use of the technique is to be avoided since answers provided follow from the data used as input.

THE COMPETITIVE POSITION OF WEST TEXAS IN COMMERCIAL VEGETABLE PRODUCTION

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Introduction and Procedure

THE purpose of this paper is to describe the method used to analyze an array of possible new alternative crops and determine the ones with the greatest probability of profit for the farmer. This method is particularly applicable to perishable crops, such as fruits and vegetables. This work was developed as a study of the vegetable market potentials and facility requirements for West Texas. For purposes of discussion the analytical procedure will be broken down into three steps: 1) production possibilities of the local area, 2) the competing producing areas, and 3) the nature of possible interregional competition in consuming markets.

An actual study does not proceed in this fashion as it is necessary to consider as many factors as are known concerning each of these problem areas simultaneously with the intensive study of each one. Such an approach requires cooperation between production specialists in the technical departments and agricultural economists. That type of analysis involves the consideration of a great many details. This paper will deal only with the three steps listed above. The cost of production would involve a paper in itself.

The following procedure of progressive approximation was developed as a method of determining economically feasible, alternative crops. It can be used either to select economically feasible crops from which farmers looking for alternatives could choose, or to evaluate the shifts which have taken place in a given area.

There are a number of factors that determine the most feasible alternative crops for an area. First is the climate of the area, including temperature ranges, growing season, and available moisture supply. All these limit the kinds of crops which can be grown and determine the possible harvest periods for each crop. A second limiting factor is technology—the know-how of the producer and his machines and labor supply. The list of crops is further limited by competition in the potential markets and quantities supplied by present sources. This excludes those for which no adequate market would exist. The availability of marketing facilities will also limit alternatives by eliminating those crops for which extensive facilities would have to be installed. This is especially the case where a significant period of time would be required to build new facilities. The historical price experience of the remaining commodities would tend to indicate

those which are susceptible to large amplitude price changes and so would involve relatively large risks.

West Texas agriculture developed on the basis of 1) cotton and grain sorghum or 2) wheat and grain sorghum. With the development of irrigation, cotton tended to replace wheat in some parts of the area, and alfalfa, a crop of minor relative importance. Also, with irrigation commercial vegetable production became a possibility. Allotments for cotton and wheat resulted in an increase in grain sorghum acreage and with lower grain sorghum prices attention was directed toward other cash crops. The declining supply of irrigation water and its increased cost caused farmers to look for high value crops in an effort to realize more for their limited water resources.

Some farmers in West Texas grow as many as 10 different vegetables, but the majority grow either one, two or three kinds of vegetables. Most large farmers limit the number to one or two vegetables. Although the total acreage planted in vegetables in the counties is rather small, there is evidence of increased vegetable plantings. Potatoes, lettuce, and onions are the more important in terms of acreage planted. In nine counties the value of production of vegetables harvested increased from \$514,872 to \$907,954, or by 76 percent, from 1949 to 1954.

Production Possibilities of the Local Producing Area

Season of production

The climatic characteristics of an area determine both the growing season and harvest time for each vegetable. During each of these periods a given range of temperature and available moisture is necessary for optimum growth and maturity. The temperature and precipitation cycles determine what crops can be produced and when they will be ready for harvesting.

Normally West Texas has 180-220 frost-free days. This long frost-free period may be divided into three short periods: (1) a production period ranging from cold to hot weather, (2) a period of hot weather and (3) a second short production period going from hot to cold weather. Since air and soil temperature have a great influence on the growing conditions of a vegetable crop, it is important to look into some of the factors of growth. The temperature of the soil at any time depends on the ratio between the heat energy absorbed and the amount lost. The constant change in this relationship is reflected in the seasonal, monthly and daily temperatures.

The surface layers vary more or less according to the air temperature. On the average, the top six-inch layer of soil is warmer than the air during every season of the year. In temperate zones, the daily and hourly tem-

peratures of the air and the soil may show considerable agreement or marked divergence according to conditions. The air temperature usually rises from morning to a maximum at about two o'clock, while the surface soil does not reach its maximum temperature until later in the afternoon due to the diurnal lag.

In order to determine what vegetables were climatically compatible with the study area, summaries were made of the reports of the U. S. Weather Bureau stations in the area.

The problem of presenting a profile of temperatures in the area was difficult because of the small range of tolerance which had to be considered. For example, a killing frost in an area will completely ruin some crops, and consequently it is important to know what the probability is of having such a low temperature during a growing season. Also, extreme changes in temperature tend to damage crops and it is important to know the probability of this taking place.

The usual statistical methods of measuring the dispersion of frequency distributions did not seem to be adequate for this particular problem. Arithmetic means would hide the strategic information. A modal range of temperatures would provide some measure of the concentration of the distribution of temperatures during a given period, but it also would leave out the possibility of temperatures exceeding the maximum or falling below the minimum for a given crop. It was finally decided to select certain critical maximum and minimum temperatures which were determined for the crops being considered, and to compute for each period the percentage of available observations for which temperatures were above these maxima and below these minima. In terms of the crops being considered, the minima were selected at 40°F and 50°F and the maxima at 80°F and 90°F.

Because freezing frost is fatal to most of the crops being considered, it was decided to include information on the first frost date of the season in the fall and the last frost date of the season in the spring. The first and last frost dates were tabulated for each year of the period for which records are available, and dates were selected that excluded all but ten percent of the observations. (The 90-percent limit was arbitrarily chosen.)

These different items of information about the temperature distribution at the station, and a ten-degree modal range along with the percentage of the observations which fell within this modal range, were recorded, together with the rainfall profile (see Table 1). Information about temperature was recorded in terms of half-months: the 1st to the 15th of the month inclusive, and the 16th to the last day of the month inclusive. This finer division was used because of the low tolerances of the plants under consideration to changes in temperature.

Another climatic factor to consider for a proposed crop is the amount and time of rainfall. It is important to have enough rainfall during the production season to mature a crop, yet a rainy season during harvesting may cause delays and be extremely harmful to a perishable vegetable crop. For example, rain on a mature green-wrap tomato crop may cause turgidity and shoulder-cracking of the fruit.

The monthly rainfall for all available years was tabulated and the percent of observations with .5 inches or more of rain in each month was computed. One-half inch per month or more was selected as the minimum critical rate of rainfall because this was compatible with all of the crops under consideration. The rainfall range each month during the period when observations were available was also recorded. These two sets of data provide a rough measure of the distribution of rainfall over the year in the area and show something of its dispersion (see Table 1).

The soil type is important in considering vegetable crops. If the soil is very tight and forms cracks when dry, it would be undesirable for a root crop because it would not allow production of a smooth root. A heavy soil is very hard to work when wet. This may result in a delay in harvesting a perishable crop, which can be costly.

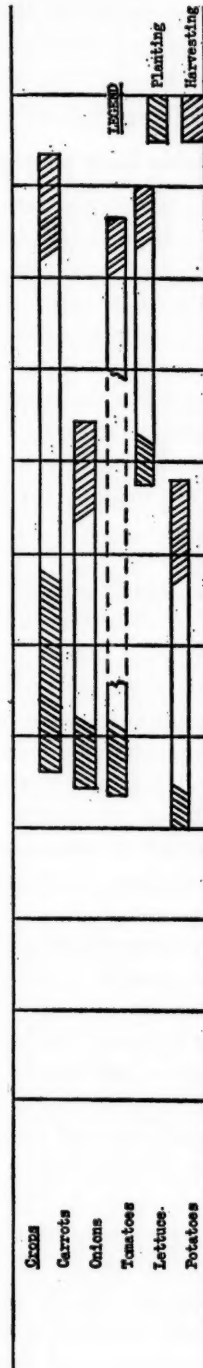
A look at some of the factors limiting growth is also important in determining the periods of production for vegetable crops. Although the chart of growth periods in Table 1 is limited to a few vegetables, it indicates how some of the climatic factors were used in the study. The production and marketing periods were established by known factors that retard plant growth of individual crops. From weather data, it was determined that 90 percent of the dates of last frost were before April 16. Thus, planting periods could be a short time before this, allowing time for seed germination and emergence. Next the temperature and rainfall during the growing period was considered. For best growth, potatoes require a 60 to 80°F temperature with 63°F for best tuber production. Tuber development is retarded above 85°F. Potatoes planted in early April could be harvested in an immature and non-storable condition in late June and July and still be marketable and of good quality. This would be necessary to avoid the high soil temperatures in late July and August which would cause spoilage.

Lettuce may be planted in relatively warm weather if ample moisture is available, but it needs cool weather of 50-75°F for best head formation. This period is in the fall, just before frost.

Tomato plants are very sensitive to temperature, and best root development is obtained at soil temperatures between 70 and 85°F. Above 85°F fruit-set is retarded and respiration exceeds carbohydrate accumulation. Translocation is retarded below 60°F and fruit-set and maturity of fruit

TABLE 1. CLIMATIC FACTORS, AND PERIODS OF GROWTH OF SELECTED CROPS, TEXAS PANHANDLE AREA, BY MONTH AND HALF-MONTH PERIODS

Factor	January 1st. 2nd.	February 1st. 2nd.	March 1st. 2nd.	April 1st. 2nd.	May 1st. 2nd.	June 1st. 2nd.	July 1st. 2nd.	August 1st. 2nd.	September 1st. 2nd.	October 1st. 2nd.	November 1st. 2nd.	December 1st. 2nd.
<i>Rainfall</i> Range (inches) Percent of observations .5" or more	0-3.35 50	0-1.97 42	0-3.56 47	.07-3.39 65	.35-12.69 90	.36-4.74 85	0-3.97 90	0-4.97 75	0-7.61 75	0-5.89 80	0-2.35 30	0-2.80 45
<i>Maximum Temperatures</i> 10° range	67 72	72 74	78 77	83 86	92 92	96 96	96 94	96 95	92 92	83 85	75 72	67 66
Percent of observations in 10° range	76 81	81 83	87 86	92 93	101 101	105 105	105 103	105 104	101 101	92 94	84 81	76 75
Percent of observed maxima—	50 64	55 78	80 75	65 80	70 65	83 85	90 85	85 93	65 75	70 70	75 80	65 78
Above 90° F	0 0	0 0	10 0	50 30	80 85	95 100	100 100	100 100	80 85	10 20	0 0	0 0
Above 80° F	0 7	15 22	65 45	100 90	100 100	100 100	100 100	100 100	100 100	95 90	25 20	5 0
<i>Minimum Temperatures</i> Percent of observed minima—	100 100	100 100	100 100	100 100	90 85	17 10	0 0	0 0	50 70	100 100	100 100	100 100
Below 50° F	100 100	100 100	100 100	90 75	30 15	0 0	0 0	0 0	10 0	60 85	100 100	100 100
Below 40° F				90%						90%		
Dates of last and first killing frost ¹				16						24		

¹ Ninety percent of observations of last killing frosts occurred before April 16, and ninety percent of first killing frosts after October 24.

is retarded below 50°F. High temperatures decrease the time between fruit-set and maturity. Thus the tomato harvesting season is delayed until fall when the temperatures are cooler. It appears to be a short harvesting period, thus reducing the number of clusters to mature.

Available labor supply

The traditional farming methods and habits need to be considered. If the traditional farming methods have been with tractor and equipment suitable for grain crops, the question of stoop labor becomes important. In such cases farm operators may find it difficult to shift to hand labor. If migratory labor is required, will the labor be available at satisfactory wage rates? It is not uncommon to hear of a mature fruit or vegetable crop spoiling because labor is not available at the wage rate offered.

Another factor to consider is the attitudes and skills of the people in the producing area in view of changes in production and marketing practices required by the new crops.

The Competing Producing Areas

The significance of determining just what specific production area one will be competing with is quite important, yet very difficult to demonstrate. Such factors as the quality and quantity of vegetables marketed from competing producing areas and the market outlets utilized assume major importance in providing information that would be useful in formulating production and marketing plans in a relatively new vegetable area. It is not necessary to present quantitative data or figures about the quality of vegetables marketed from other areas. For example, those interested in tomatoes are usually aware that a high quality tomato is shipped from California; thus, the success of efforts to capture a portion of the market hinges to a great extent on growing quality tomatoes at a cost competitive with California.

The general area in which potential markets might be found was delineated by considering transportation costs from Texas to the different major terminal markets in the United States, and comparing them with the competing supply areas in these markets. Using a general knowledge of the vegetable distribution system of the United States, and considering truck and rail rates for vegetables, the feasible markets were limited to the Central States. The Florida producing area has a transportation cost advantage in all markets on the East Coast. California obviously has an advantage in all markets west of the Rockies, and because of back-haul rates, has an advantage in some terminal markets such as Chicago, Detroit, etc. In the case of Texas, there already existed an established vegetable producing area—the Lower Rio Grande Valley—where experience substantiated these deductive conclusions.

Once the general area of potential terminal markets was determined, feasible markets and the vegetables which would be competitive in these markets were determined by analyzing the flow of each commodity from the existing geographical sources of supply. Analyses were in terms of the relationship between the quantity shipped to the market area, time of delivery and the quality of the produce.

A new producing area can invade a market on the basis of three main factors: quality, price, and time of delivery. It can provide an equivalent quality product at a lower price, a higher quality product at an equal or lower price, or it can ship to the market during a period when shipments from the established supply areas are low or nonexistent. The last possibility is the most favorable in terms of moving into established markets.

In attempting to reveal periods of low supply from competing production areas and to determine when production from West Texas could be moved into the markets, shipments of vegetable crops into various markets were analyzed. Data from U. S. D. A. were obtained on shipments of various vegetables, such as tomatoes, carrots, lettuce, onions, cabbage, cantaloupes, potatoes, and peppers, into the following markets: El Paso, San Antonio, Dallas, Ft. Worth, Houston, Amarillo, Lubbock, Shreveport, Oklahoma City, Tulsa, New Orleans, Topeka, Wichita, Kansas City, Butte, Denver and Minneapolis.

Analyses of railroad car and truck unloads of various vegetables from Texas and competing states in these Central States markets indicates that West Texas had definite possibility of competing for a share of the total market for most of these vegetables.

The following procedure was followed to find the periods of low supply of competing production areas which would represent possible market periods for production from West Texas.

The Agricultural Marketing Service monthly report of unloads of fresh fruits and vegetables at 100 selected cities gives unloads by State of origin. For the period 1954 through 1958 separate tabulations were made for each commodity compatible with the physical characteristics of the area and also for each state offering possible competition to West Texas.

Graphs made for each vegetable summarize the supply and demand factors present in a geographic market for a given vegetable. The "other states" series indicates the supply response which could be expected from producing areas having a transportation disadvantage in the Central States market. Assuming no difference in quality, West Texas is in a very favorable competitive position relative to these supply areas.

To eliminate minor fluctuations, peaks and troughs on the graphs were selected by visually using a rough approximation of smooth curves. The last month unloads, when shipments were reported stopped, and the first month unloads were also considered.

A typical example which we were seeking is lettuce, shown in Chart 1. With the exception of one peak in September, there was a drop in total supply from August to November. The bars below the total indicate the behavior of the individual supply areas. Shipments from California normally reach a peak in July, drop into a trough in August and remain low for the balance of the year. Arizona is either at a low level or is completely out of the market from June to October. The Texas Lower Rio Grand Valley is out from April until December. Other states respond to this by shipping into the area but climatic and market factors (when California production is low, the national supply will be low) tend to concentrate these shipments during the early part of the period. Excluding our study area, this information indicates a period of low supply from September to November which, under present supply conditions will probably not be filled by other supply areas. This also provides some leeway for shifts in harvest dates.

This potential supply period was then compared to the results obtained by matching the growing requirements for lettuce to the climatic characteristics of the study area. The result is a matching of the potential supply period to a physically feasible growing and harvesting period. The conclusion is that lettuce is a potential alternate crop in this area.

The lowest bar on the graph—West Texas—is consistent with this conclusion. It indicates that growers have moved into lettuce production during this period of low supply. Shipments from the area usually reach a peak in October and cease by November or December.

An example of a less well-defined case is carrots, shown in Chart 2. An examination of the total unloads does not indicate a discernable pattern. During the five years observed, two troughs and one peak occurred. The pattern of the different supply regions indicates that the inconsistency in total unloads results from variations in shipments from each supply area.

There is a cyclical low period in two or three years out of five—usually from September to November. California unloads were in a trough four out of the five years usually in September or October. Arizona normally is not shipping during these months while other supply areas appear to ship into the area. West Texas growers have tried to fill in this September gap. Significant shipments were first made in 1958 when production was also high and California shipments were still low. Carrot acreage in West Texas was increased during 1959 because of the successful 1958 season. However, this is a precarious position. During the 5 years, California shipments reached a peak once in November and twice in December. Shipments from other states reached a peak in October once out of the five years. If West Texas maintains the same planting and harvesting schedules in the future that were used in 1958, there is a high probability that

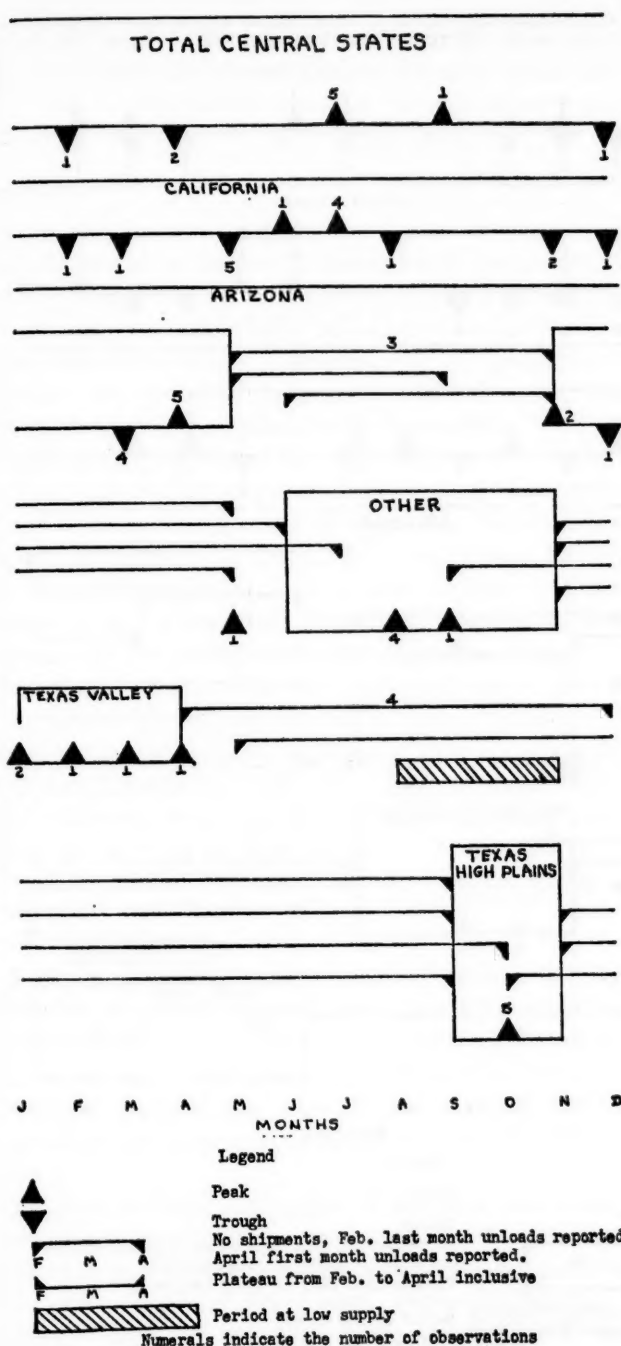


CHART 1. HIGH AND LOW PERIODS OF LETTUCE SHIPMENTS TO THE CENTRAL STATES OF THE U.S., BY PRINCIPAL AREAS OF ORIGIN

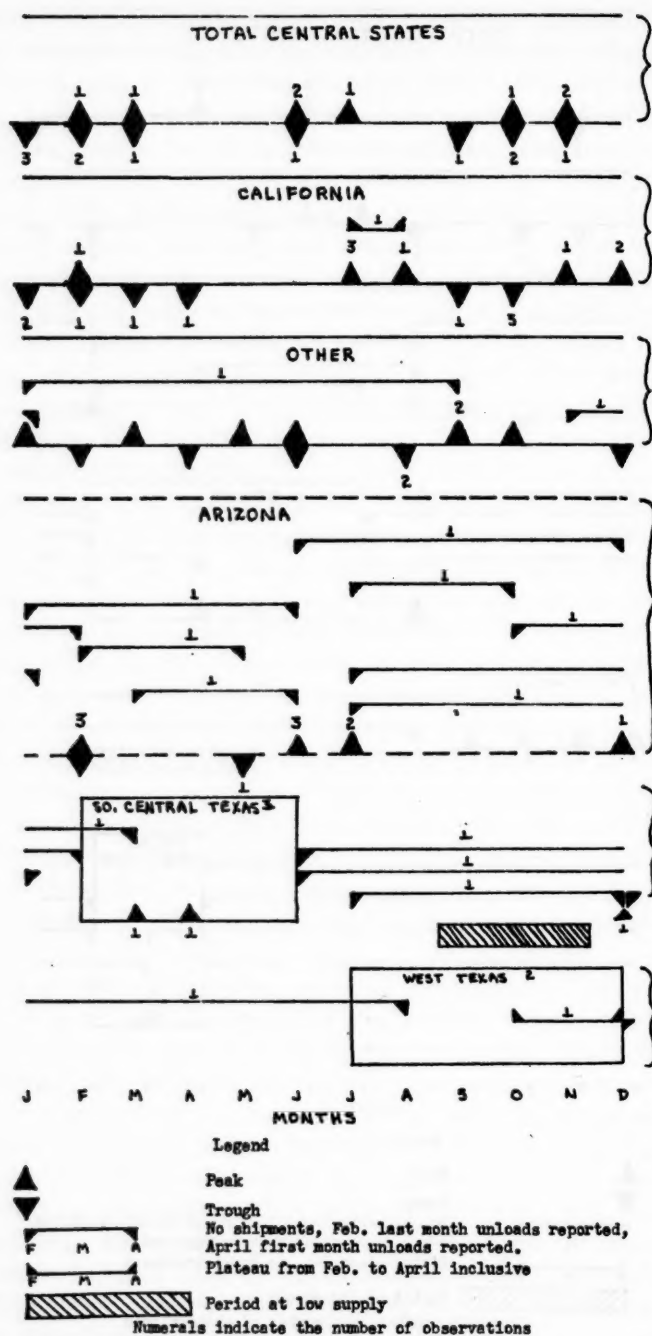


CHART 2. HIGH AND LOW PERIODS OF CARROT SHIPMENTS TO THE CENTRAL STATES OF THE U.S., BY PRINCIPAL AREAS OF ORIGIN

this will coincide with California at least half the time. However, it is possible to move back the harvest date to the safer period around October. Table 1 shows that carrots could be planted as early as the end of July or the first of August and be harvested in October.

Price of product

An attempt was made to explain the causes of price variations and fluctuations. Since risk is directly connected with price variations, this is an important phase of the research study and yields valuable information to the farmer who is contemplating inclusion of one of these crops in his farm organization. It is evident that predicting the probable returns from any particular crop becomes increasingly difficult when this crop has historically experienced precipitant price fluctuations.

A brief discussion is given of the technique used to study price variations. In this study it seemed reasonable to assume that production, both in Texas and in competing areas, and disposable National income would affect the prices received by farmers for vegetables. In analyzing the effect that these had on prices, a correlation analysis was used to relate price changes in past years (from 1940-51) to changes in Texas production, production in competing areas, and disposable National income.

A coefficient of determination was computed which gave the percent of price variation explained by changes in Texas production, production in competing areas and disposable National income. Computation of the partial correlation coefficient indicated which of these three things has the greatest influence on prices. By knowing something about the reaction of price to changes in these factors, a farmer can be in a better position to anticipate the probable price situation for a crop.

Shippers and packers

After checking the producing area and the volume of produce in the terminal market, the local shipping area should be considered. One of the first considerations should be to determine if one or more local shipping points is needed. Consideration should also be given to availability of facilities (such as buildings, roads, railroads, truck lines), of labor to pack the produce and of reputable buyers and packer-shippers to handle the produce.

If consumption is local, determine if the area can consume all the supply, and who is supplying the area currently. If production is nearby, local suppliers may not have a freight advantage, but must rely on high yields and better quality at lower costs. Buyer-shippers are essential in the marketing of fruit and vegetable crops. However, they cannot be expected to move into the shipping area if the shipping season is very short or if the volume is too small for profitable operation.

The buyer-shipper needs adequate facilities to pack fruit and vegetables. These facilities should be readily accessible by local farm-to-market roads or State highways.

Where there are many producers in an area, the fruit and vegetables produced will vary considerably in quality unless some control is exerted over production and fertilizer practices, insect and disease control, and harvesting and marketing practices.

The greater the variations in quality of a product, the more complicated the grading, sorting and packing operation. This leads to higher costs of packing and reduces whatever price advantage may exist in an area.

Conclusions

A full study would require that a region be broken up into small areas for analysis because of the relatively high degree of geographic variability of climate. As a rule the technique used to make recommendations to farmers in an area would require that the analysis be carried one step further than has been done in this paper. Alternative crops would have to be provided to allow for the contingency of unexpected changes in climatic conditions such as an unusual period of rainfall which would prevent planting for several weeks. Thus, the farmer would be in a position to select an alternative crop whose characteristics would be consistent with the new climatic conditions.

The methodology is particularly applicable to perishable commodities. The importance of seasonal fluctuations in climate in different areas of the country as a determinant of the rate of supply available over time is not as important for the crops that are storable so that fluctuations in supply can be smoothed out.

Finally, as a technique for developing recommendations for farmers, this method is subject to predictive errors, an estimate of which should always be included in any recommendations. It is possible that these errors can be reduced or pointed up more precisely by introducing programming techniques at different stages of the analysis.

An intensive program such as this requires cooperation of knowledge, time and effort between the specialist of the involved technical departments, and marketing and farm management specialists of the department of agricultural economics. Through this close working arrangement, everyone obtains a better understanding of the others' problems. Thus, there may be an increase in the efficiencies in the production and marketing practices of the product.

DISCUSSION: STUDIES OF INTERREGIONAL COMPETITION

SARGENT RUSSELL

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These three papers, although they all deal with interregional competition, do not all deal with the same phase of the problem. Professors King and Henry have given us much background and brought us up to date on the latest approaches for explaining and predicting the location of agricultural production, namely, the transportation model with modifications. Professors Tramel and Seale have taken one of these modifications, variable amount demanded, and explained a procedure for reaching a solution. Professor Sorensen has explained a step previous to the application of the transportation models—that is, a systematic approach for determining what crops may be produced in an area.

All of the authors have, in my opinion, offered an organized system for doing what farmers and the handlers of agricultural products have been doing in a more random or haphazard and time consuming way ever since agriculture began. If we go back to the settling of this country, we will find that the first problem of the newcomers was to find out what crops would grow in the new land. They had no data on growing seasons and rainfall. Their knowledge of varieties, fertilization, and techniques of cultivation was meager. Perforce they resorted to time-consuming experiments. Progress was slow. Now with the accumulation of data on many of the factors related to production of a crop, Professor Sorensen has outlined a systematic approach for determining what can be produced. He has also gone beyond the mere physical production of the crops and systematically examined markets to see if and where the crop can be sold.

At the point of choosing markets, he is getting into the realm which is more objectively or accurately covered by our other authors. As a matter of fact, even the actual crops to be grown in a particular area may be chosen, again more accurately, by the methods of our other authors. This is not to say that a mathematical approach can decide whether or not carrots, tomatoes, lettuce or any other crop can be grown in an area (this is still the distinct province of Professor Sorensen's approach) but once the feasible crops which can be grown have been determined, then, given total resources of the area, cost functions for production, and demand functions of the markets, the most profitable crops to be grown in the area could be determined mathematically.

Care would need to be exercised in this type of determination, even with the objective interactive techniques of mathematics, because the determination of most profitable crops calls not only for interplay of crops within an area, but also for interplay of the same crops between areas.

Because of the complexity of analysis, it is little wonder that many of us shy away from the mathematical approach because it does require considerable skill and many hours of routine calculation.

Possibly Professors Tramel and Seale would appreciate some evaluation or comment on their procedure (algorithm) for solving the modification they have made of the transportation model. Quite frankly I must admit that my skills are not sufficiently perfected to offer any comment or suggestion in this vein.

Professors King and Henry may also be looking for something specific in regard to the claims they have made for possible modifications of the transportation model. Again I bow out for the same reason as given above.

To admit to an inability to comment on the procedures and possibilities of the mathematical approach has been a struggle. Rather I might have climbed on the bandwagon to attack the transportation model and its modifications on the grounds that the assumptions made are not correct, that the procedures used do not yield correct solutions, that the problem being tackled does not lend itself to mathematical solution, that the factors being maximized or minimized are not the only factors to be considered and that there are better methods. The riders on this bandwagon are made up of two groups. The first group is those who know enough mathematics and who have adequately studied the techniques so that they can make constructive criticisms. The second group is those who do not know enough mathematics and/or who have not thought through the techniques and therefore to overcome their feeling of inferiority attack this approach by the side door of assumptions, etc. We have seen and still see the same thing as far as the use of statistics is concerned.

However, as nearly as I can determine, and a lack of skill makes the appraisal weak, the mathematical analyses which have been proposed here today are a statement in symbolic language of what farmers and handlers of agricultural products have been doing for years. You can see the process in action in West Texas or the Connecticut Valley where changing conditions make new crops a necessity. Each year farmers and handlers try a new iteration. Consciously or unconsciously, they make assumptions about the demand for different crops in different markets. They have a fair idea of their costs of production. Transportation rates are no mystery. Then they put in crops in varying quantities, ship them to different markets and observe what happens. This leads to the next year's iteration.

The difference between what farmers and handlers are doing and what men like Professors Tramel, Seale, King, and Henry are doing is a matter of knowledge and time. The professors' knowledge of demand functions, cost functions, transportation charges, alternative crops, marketing costs and other factors is better than that of farmers and handlers. The time

that it takes to work through an iteration on a computer is much less than a crop year.

Some might argue that the iteration of farmers and handlers is tested against the actual demand, supply and other functions and therefore yields a more valid basis for the next trial. This argument may be valid only if one assumes that a single observation for determining demand, supply and other functions is better than an average of several years. To argue that the actual situation of a given year is better than an average of several years is much like saying that the way a crop grows in one year is a better determination than the way you can expect a crop to grow in relationship to the average conditions of several years.

Therefore, just as you can determine what crop can grow in an area if you use accumulated data and study the prospects systematically just so you can determine the most profitable location of production areas if you systematically examine different combinations of amounts in different areas. The model may not be perfect and the assumptions may be just close approximations, but we need to remember that we use many ideal descriptions which are not realized in actuality. The Gaussian normal curve of error assumes infinity. The description of the swinging of a pendulum assumes frictionless fulcrums and mediums. The assumptions are impossible in both cases, but the descriptions are most useful.

To be sure the basic data, the solution procedures, and the factors to be minimized or maximized of the mathematical approach need constant improvements and revisions. There are also other parts of the interregional competition problem. Determination of feasible crops has been mentioned. In addition, the sociological changes which will ensue if recommendations are followed and the political organization necessary for carrying out a mathematically determined best located plan of production will also need careful thought.

There is only one strong objection to today's program. It rests on the difficulty of trying to explain, in the manner used, a relatively complicated mathematical procedure. I would guess that the number who managed to follow, comprehend and appraise the papers of Professors Tramel, Seale, King and Henry was small. But is this an object of these meetings?

DISCUSSION: STUDIES OF INTERREGIONAL COMPETITION

RICHARD J. FOOTE
Connell & Company

Two points in particular interest me in these papers: (1) Both Professors King and Henry and Professors Tramel and Seale present methods that would seem to have applicability to the problem considered by

Professor Sorensen. Yet he chose to ignore these methods, which depend heavily on mathematics and electronic computers, and to use instead a more direct tabular and graphic type of solution. (2) No mention has been made of the use of simultaneous equation models as a means of studying interregional competition and of allocating supplies among various geographic areas. I shall confine my comments chiefly to an exploration of these two topics.

A curious fact in economic research is that methods of analysis that are presented in textbooks and classrooms based on illustrative examples for a few commodities and a half dozen regions so frequently are ignored when we are faced with real-life situations that involve dozens of commodities and perhaps several hundred shipping and receiving points. Yet the latter situations are the sole reason for developing relatively high-powered methods. Almost anyone using simple arithmetic or perhaps merely pure logic can arrive at the right solution for the textbook examples. But even the greatest of geniuses frequently will go astray in the real-life situations unless he is assisted by some systematic scheme of analysis such as that provided by linear programming, or similar approaches. Perhaps it is at this point that our teaching fails—the student can do the examples more easily by arithmetic than by “programming.” Hence, he assumes that the same is true in real-life research.

On the other hand, perhaps these real-life problems *are* too large to handle on present-day computers. Professors Tramel and Seale indicate that 1½ hours of IBM 650 time was required for their problem involving *one* commodity and 56 areas. (It is not clear whether this is for one time period or all twelve.) Professor Sorensen, I am sure, would have wanted to consider at least a dozen alternative crops and at least 50-100 areas. I would be interested in hearing from the other participants in this program as to whether programs exist to handle problems of this magnitude and whether they are computationally feasible.

I have one further point before I leave this general topic. Most of these analyses depend on given demand and supply curves for each area. Have any tests been run to determine how sensitive these methods are to changes in these supply and consumption elasticities? Transportation costs can be determined fairly exactly for any given time period, but in most studies relatively large standard errors are attached to the elasticity coefficients.

One problem which has been mentioned is that of determining the relevant supply and demand curves for the various regions or areas being considered. Presumably, these are to be determined by single-equation studies for each area. Yet if these several demand or supply schedules simultaneously affect price, then all of them should be statistically measured by a system of simultaneous equations. And, if such a system has been fit, then

the allocations from or to specific regions will be given directly by the model.

We have fit a model for cocoa beans which allocates total world production between (1) the United States and Canada, and (2) the United Kingdom and Europe. These relatively large geographic units were used to avoid to the extent possible having to allow specifically for foreign trade in cocoa products. We do allow for net imports of cocoa powder by the United States. We plan in the near future to expand this model to allow separately for production from (1) Africa, and (2) other areas of the world, chiefly South America. We also have fit several models for potatoes which allocate supplies from major producing areas into either (1) direct consumption, (2) Government diversion programs, or (3) stocks to be used in a subsequent period. In as broad a survey as that made by Professors King and Henry, it seems strange that *no* mention was made of this simultaneous equations approach. However, it must be admitted that practically nothing has been published in this area.

Before I close, I would like to say that "Reactive Programming" has more intuitive appeal for me than does linear programming and appears to be a highly useful tool to be added to the econometrician's kit. Professors Tramel and Seale are to be congratulated for its development.

DATA FOR INTERREGIONAL STUDIES

Chairman: Niels Rorholm, University of Rhode Island

THE STUDY OF REGIONAL FOOD CONSUMPTION

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BOTH the supply and the demand for information on food consumption in subnational areas have been changing in recent years. The objectives of this paper are (1) to consider how the purposes of regional consumption analyses affect data needed, (2) to review and appraise the usability of available data for certain types of analyses, (3) to demonstrate the potential uses of those data, and (4) to suggest long-term objectives and programs for the development of information regarding regional food consumption.

Purposes of Regional Consumption Analysis and Characteristics of Necessary Data

Food consumption patterns of regions of the U. S. are studied as part of research of several types. Knowledge of the production-consumption balances of each region for all foods and major items is needed for general economic research and for research on broad-gauge problems of food production and marketing. Also, we can find out more about changes in U. S. consumption by studying the effects of combinations of economic and social forces operating in each region. Perhaps the most pressing needs for study of regional food consumption come from the requirements for information to back up market development programs for major foods by agricultural groups, Government, and business.

Requirements for data on regional food consumption are determined largely by the problems being studied. For general policy problems, we can operate with information for rather broad commodity groups and large groupings of households (e.g. all urban South) providing the statistics supply general indications of historical changes for each area within the known changes in overall U. S. food consumption.

The extent of the food detail needed for analysis of the effects of variations in economic and social forces depends upon how detailed is our knowledge of those forces to which the food information is to be related. For study of relationships of consumption of meat to income and urban-

¹ The author wishes to acknowledge the assistance of Robert J. Lavell in preparation of this paper.

zation, for example, an analyst can work with rather broad strokes. But to study the effects of prices and marketing problems on consumption, he needs more precise data on trends in consumption of a specific type of commodity, as lean pork or ham, along with the related details on prices and marketing channels.

Statistical requirements for studies of regional consumption to be used in planning for and implementing market development also vary. Consider first the several aspects of market development for which study of regional trends is needed: For planning changes in investment in processing and distribution facilities, for tailoring products to meet changing area preferences, and for sales management and promotion. Next, we note that those organizations concerned with major commodities or commodity groups can work with rather general information regarding historical trends and patterns in consumption of their commodities. But organizations that are concerned with individual commodities need detailed benchmark data for consumption of that commodity and its competing products by groups of households within the region. They also need information about characteristics of users as opposed to nonusers.

Review of Available Data

Available statistics include the disappearance type of data, cross-section data from one-time studies of household consumption, sample studies of away-from-home food consumption, information from cross-section panels of consumers, and several types of data on sales by retail stores.

Disappearance type of data

As Winn Finner points out in his paper, there is no set of data which provides overall coverage, but there are many pieces. For States such as Florida and California that have information on shipments across their borders, it should be possible to develop relatively good data of the disappearance type for some commodities. The operation of marketing agreements can form an important source for generating information on marketing of particular foods. Another source of disappearance-type data is special surveys of distributors of a given commodity. The survey of rice distribution provides an example of this type.

The development of disappearance data for subnational areas presents a challenge to State personnel and marketing firms to make use of a variety of bits and pieces of information. The market unload data for trucks and the waybill sample for railroad shipments disappoint many researchers, as does the lack of commodity detail for retail sales in the 1954 and 1958 Censuses. Probably the would-be users of such data need to make their demands known rather than suffering in silence.

Data from one-time household surveys

The major one-time surveys of household food consumption have been conducted under the leadership of the Institute of Home Economics and the Bureau of Labor Statistics. Because of lack of space here and greater usability of the Institute's data for regional research, I will concentrate mostly on their survey data. These usually pertain to consumption in a week of spring. However, in the 1948-49 urban surveys, seasonal data were collected for four cities. The Institute's surveys provide information on the relationships of food quantity, value, and the proportion of households using the commodity to major economic and social characteristics of the household such as income, family size, urbanization, and characteristics of the homemaker such as age, education, and employment.

The Institute tabulated its spring 1948 urban household data to provide a North-South break for broad food groups. The size of the sample limited the detail which could be obtained from those tabulations. But detailed statistics on consumption in four cities were collected and published. Several Agricultural Experiment Stations of the South and the Institute of Home Economics cooperated in a survey of food consumption in 1947 in three type-of-farming areas. The sample was not designed to provide regional data, but the survey has yielded useful information on interrelationships between food consumption and major economic and social factors.

The Institute of Home Economics surveyed food consumption by rural households in the North Central Region in 1951. The information has been tabulated for farm and rural nonfarm households and provides a considerable amount of detail which is comparable in most respects with the 1955 survey data.

In spring 1955 the Institute of Home Economics and the Agricultural Marketing Service cooperated in a large-scale survey of household food consumption. This survey provided detailed data on a week's consumption of around 250 commodities for households grouped in 4 regions, 3 urbanizations within each, and by income group within each urbanization. The detailed data were published in Survey Report 1 for the U. S. and Reports 2-5 for the regions. From these data cross-section indexes have recently been constructed by the Consumption Section of AMS to match the time-series indexes of per capita food use of farm commodities from all sources and purchased only, in terms of farm values, and for per capita consumption of all food measured at the retail level.²

² The U. S. indexes were described and published on pages 25-29 of the February 1959 issue of the *National Food Situation* (USDA:AMS). The commodity subindexes are published in the article "Introduction of New Regional Indexes for Food Consumption Analysis" by Robert J. Lavell, in the July 1959 issue of that quarterly.

Development of historical data

Although the 1955 regional data on household food consumption are quite satisfactory for most analytical purposes, there are serious problems encountered in matching them with regional data for earlier periods. Information from earlier small-scale surveys is now being assembled, but comparisons are very difficult. Available data may do no more than provide clues of interrelationships among income groups and urbanizations during earlier periods. Fortunately, the retail sales data match well enough with the regional variations in average consumption indicated by the cross-section data that they can be used as indicators of overall changes. We are also pulling together regional information on income, sales, urbanization, and so on for earlier periods. Soon we will test backward extrapolations of the 1955 patterns or rates of consumption with these data to see how they check out with national trends and marketing information.

Subregional data

One of the most important uses of regional data is the provision of benchmarks for developing subregional data, as for States. Without commodity-line breaks of retail sales or special surveys, researchers have to rely on economic and social indicators such as average personal income before taxes, farm income, some Census data on income-size distribution, and population by urbanization from the decennial Census and special surveys along with regional consumption data for 1955 to estimate subregional data on food.

In developing subregional data, certain assumptions or generalizations must be made concerning relationships of consumption and income in the smaller area to income distributions of the region and the household consumption rates for the region. The subregional estimates can be checked with information from marketing agreements, records of inspection, unload data, probably some local surveys, and the Census data on retail store sales. The fact that average sales per person of retail food stores plus food sales by direct sales organizations have checked out reasonably well with variations shown by the 1955 data gives confidence to the use of such checks for subregional estimates.

Problems with 1955 regional data

The benchmark data from the spring 1955 survey have some limitations. Most important is the lack of information on the quantities of major commodities consumed in eating places because the household survey obtained quantity data for home use only. The 1956 survey of employee food operations in large manufacturing plants supplied regional data, but it covered only a small part of the eating-place market.

Another limitation of the 1955 household benchmark data is the fact that the data were for spring only. Therefore, one must make generalizations or adjustments for those individual commodities whose consumption varies markedly with the season.

Also, for some of the newer commodities or products, there have undoubtedly been changes in consumption patterns since 1955. Fortunately, these limitations do not appear to be particularly significant for major foods and food groups.

Other types of data

Some analysts undoubtedly make or can make use of regional information stemming from other sources. One of these is the sample study of employee food services just mentioned. Another is the cross-section panels of consumers run by private research firms which provide regional data for many commodities. For example, the panel of the Market Research Corporation of America is subdivided into 5 regions.³ The Department of Agriculture has obtained MRCA information on only a limited number of commodities, and few regional analyses of these data have been made by Department staff members.⁴

A third type of data comes from surveys of retail stores, such as the audit of sales by retail food stores by the A. C. Nielsen Company. Special surveys of retail store sales of particular commodities have been made in local areas and reported in the literature from time to time, but they have not been tied into overall regional estimates.

Use of census data on retail trade is complicated by two facts. Substantial quantities of food are sold by other types of establishments than retail food stores, and the sales of retail food stores include increasing quantities of nonfood commodities. If these differences in coverage are recognized, one can use the regional data and subregional data for general analysis.

Examples of Use of Available Information on Regional Food Consumption

Despite the limitations of available statistics, we can proceed even now with study of a number of regional problems related to food consumption. In support of this claim, I review here some findings of our research to date and refer to other research in progress. We can use available information: (1) To describe broad outlines of regional differences, (2) to

³ Certain problems in matching the 1955 U.S.D.A. survey data with MRCA data were described by this author and Thomas J. Lanahan, Jr., in "Use of 1955 Food Survey Data for Research in Agricultural Economics," *Agr. Econ. Res.*, July 1958.

⁴ A recent example is by Robert B. Reese, *Family Purchases of Selected Frozen Fruits and Vegetables*. Mktg. Res. Rept. No. 317 (USDA:AMS, April 1959).

draw inferences regarding historical trends in regional food consumption, (3) to study the effects of changes in economic and social factors, (4) to study historical trends in regional production-consumption balances, (5) to appraise the pressures for changes in regional food production and marketing patterns and institutions, and (6) to develop subregional analyses.

Broad outlines of regional differences

Regional differences in overall food consumption rates indicated (a) by per capita sales of retail food stores, direct sales organizations, and eating places from the 1954 Census of Retail Trade and (b) by the Survey of Household Food Consumption in spring 1955 are quite similar. Levels of the two sets of data are not comparable because of differences in coverage, but the regional variations are surprisingly close.

Alternative measures for overall food consumption provide somewhat different indications of regional variations. There is much more regional variation in expenditures for food than in the market value of all food (including home-produced supplies). This reflects regional variations in the degree of urbanization and income. As the North Central Region and South become more urban and as incomes rise in the South, we may expect greater increases in food sales per capita in those areas than in the Northeast and West.

The three new cross-section indexes for the quantity of food consumed, based on the 1955 household survey data, yield indications of differences in overall use of farm food commodities from all sources, purchased farm foods only, and food consumption measured in retail terms.⁵ They show that average use per person of farm food commodities varied from 7 per cent above the U. S. average in the North Central Region and West to 9 per cent below in the South. Average purchases of farm foods varied from 85 per cent of the U. S. average in the South to 112 per cent of the U. S. average in the West. Regional variations in the retail measure for all foods were quite similar to those for farm food commodities from all sources.

In the South per person food use of farm commodities averaged lower on farms than in urban households whereas farm households in the Northeast and North Central Region used more farm foods per person than did urban households. The farm and urban rates of use in the West averaged about the same. In each region except the West, farm households used half as much purchased farm foods per person as urban households. These facts underlie our great expectations for increases in the market for commercially produced and marketed farm foods in the South and in other regions where the off-farm movement will be substantial.

⁵ References given in note 2.

Regional differences in the use and purchases of major groups of foods in terms of their farm values can be studied by means of the detailed data published in the July 1959 *National Food Situation*. The ramifications of such analyses are too extensive for description here.

Historical trends in regional consumption of major commodities

This is an area where the need for information is great. This need can be gradually filled by piecing together the bits and pieces of available information mentioned earlier. Some research of this type is under way in the Consumption Section, AMS, but most of it will have to be done by State researchers who are more familiar with the details of the local situation.

We have made some analyses of changes in consumption within a single region. In one paper, I used information on consumption by southern urban households from the spring 1948 and spring 1955 surveys to describe historical changes in southern food patterns.⁶ It is safe to generalize, I believe, that southern food patterns will continue to move toward those of other regions as incomes rise and people move off farms.

In another paper, I used census data on per capita sales of retail food stores plotted against per capita income statistics of the Department of Commerce to show that the Southeast is following the path of income-food sales relationships already traced by the North Central Region.⁷ Therefore, one can gain considerable insight about future trends in southern food consumption by comparing the spring 1955 averages for the South and the North Central Region.

Apparently, food consumption patterns of the several regions are becoming more alike. Certainly there is evidence that U. S. urban and farm consumption patterns for food are drawing closer together and strong economic and social forces are pressing for homogeneity of food patterns throughout the country.

Effects of changes in economic and social factors

If an analyst's projections of food consumption depend upon an increasing degree of urbanization and increasing income, he needs to keep in mind the regional location of the farm and nonfarm population and of the preponderance of the low income households. For example, the changes in demand for commercially produced and marketed foods in

⁶"The Relationship of Food Consumption Patterns of the South to New Developments in Marketing," for the Marketing Section of Association of Southern Agricultural Workers at Birmingham, Alabama, Feb. 7, 1957.

⁷"Changing Consumption Patterns in the Southeast." Paper presented to the Conference of the Georgia Bankers Association at the University of Georgia, Athens, Georgia, Feb. 19, 1958.

the South may be far more explosive than those in other regions *providing* institutional factors and limitations on capital investments in food marketing do not enforce continued lags in the adjustment of food consumption to changes in economic and social factors. The 1955 survey data indicate more extensive home production of food in the South than in other regions. This differential was partly due to the earlier season there, but it also may reflect lags in the availability of food marketing services and in changes in food buying patterns as income and urbanization have changed.

Historical trends in regional production-consumption balances

Lanahan and I have worked out some 1955 regional production-consumption balances for all foods combined and for several major commodities.⁸ Until regional consumption "guesstimates" can be developed for earlier years, we must rely on comparisons of regional output with population distributions, thus assuming no variation in average consumption from region to region. Comparisons of changes in regional shares in the output of farm food commodities (based on aggregates of the net farm output indexes computed by the Farm Economics Research Division, ARS) and changes in regional distribution of the population provide indications of major shifts in food marketing. There is no time here to discuss them, but such research leads us into problems of comparative advantage, restrictions on interstate and inter-area trade, and the inertias of marketing and producing institutions.

Pressures for future changes in production and marketing

Analysis of available regional food consumption data can form a basis for preliminary appraisal of the pressures for future changes in regional food production and marketing patterns and institutions. Most projections must begin with projections of population by region such as those issued by the Bureau of the Census from time to time.

In recent months the Consumption Section has been cooperating with other staff members of the Agricultural Economics Division, AMS, and of the Farm Economics Research Division of ARS in preparing some projections of food consumption in the West for comparison with projections of production. We began with assumptions about relative prices, real income, patterns of consumption in relation to income and urbanization, and some ideas on likely urbanization shifts. The first approximations are being compared with projections of production to check the relative price assumptions. We must consider possibilities of changes in consumption patterns and the question of institutional restrictions on changes. To be humbly realistic, we should use ranges for assumptions regarding income, urbanization, and price and develop ranges in the consumption projections. The

⁸ Described in the article cited in note 3.

use of a single figure for projections assumes far more knowledge than we possess. Other needed refinements are subdivision of the estimates into purchased and home-produced supplies and consideration of possible technological changes in production and marketing and in consumer demand.

Long-Term Objectives and Program for Regional Analysis of Food Consumption

Our basic objectives in the study of regional food consumption are to develop the types of analysis likely to be useful in the study of major problems of agricultural and marketing adjustment. From these objectives we may deduce the objectives for development of data, not vice versa. However, I outline first a suggested program for development of data on regional food consumption.

Suggested program for data

In some ways the following suggestions may seem visionary. But when one considers the major changes in food consumption data which have occurred in the last 20 years, they seem feasible. Certainly, we may hope for a series of regional consumption surveys at perhaps 10-year intervals which will provide us with descriptions of variations in household food consumption for, preferably, the seven new Census regions. The household data need to be supplemented by benchmark information for eating places.

Food marketing agencies could make much use of distribution data based on deliveries to major markets on a regular basis, such as the carlot unload data. We may hope that the Bureau of Census can work out a sampling system to provide us with commodity-line data by State for the wholesale and retail trade censuses at five-year intervals. Smaller scale surveys of local markets will, of course, be necessary to supply information for particular purposes, as in the past.

From some exploratory work I have been doing on marketing services, it seems to me that we need to design and make periodic surveys of the use of food marketing services by consumers and retailers. Even from information now available, I believe that it is possible to construct usable food price indexes by region and even indexes of the prices of food marketing services. By assiduous research, we can expect to construct indexes of the quantity of marketing services bought with food for the United States and probably for major regions.

Objectives and program for analyses

Regional analyses of food consumption can be grouped under three headings. The first of these is the description of regional variations in

the consumption of food per se and trends in consumption for all foods and for major commodities. For major commodities, we need annual per capita data of the disappearance type. Five-year benchmarks for minor commodities would be justified. For all individual food commodities, we need decennial benchmarks for regional variations and for subgroups of households within the region.

A second type of analysis is the description of regional variations in marketing services bought with food. We need annual information and analyses of changes in the major forms of services bought with major commodities, such as processing and the services of retailers. More detailed studies should be made at 5- and 10-year intervals using the census data and the proposed decennial surveys of consumption in households and, hopefully, in eating places.

Finally, we need intensive analyses of the relationships of changes in food consumption and in use of marketing services to major economic and social factors. On the one hand, we need these changes related to supply factors in the short and long run. Such analyses would range from the outlook type to the development of long-run projections of production-consumption balances. On the other hand, we certainly need studies of the relationships of changes in food consumption and in use of marketing services to changes in demand factors. Important among these are income and urbanization. As our knowledge of food consumption increases, we will probably identify other key factors. At higher levels of income, changes in our ways of living and eating may reflect mostly changes in education and occupation, not income. Certainly our analyses should be developed to tell us more about the interrelationships between food and marketing services and among foods.

Conclusions

My conclusions are these: We now have the necessary data to do far more regional analyses than we have attempted. But the current demand for analytical findings based on regional variations in food consumption exceeds our potential supply of analyses and of data. Future demands can be met if we analysts demonstrate our wares effectively so that additional resources will be made available to supply both our data needs and the trained manpower to make the analyses.

INTERSTATE AND INTERREGIONAL TRADE FLOWS FOR AGRICULTURAL PRODUCTS

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A SIGNIFICANT percentage of agricultural production, either in raw or processed form, is transported across State boundaries before it is consumed. For many products the divergence between per capita production and per capita consumption for given States and regions may show future increases in response to further regional specialization in production, changing transfer costs, and differential changes in population, incomes, and other forces influencing consumption.

The purposes of this paper are to: (1) Indicate briefly the general uses in economic analysis of data showing commodity movements among geographic regions and States; (2) describe the principal present sources of such data, and (3) comment on the more likely sources and methods of data improvement.

Uses

Early formulations of economic theory—while devoting considerable attention to international trade—were essentially concerned with national aggregates and the significance of time as a variable affecting them. It has been largely during the past few decades that regional economics has become an important field in theory and research. The economic repercussions of changes in a given region on national aggregates and on the economies of other regions have led to increased research on problems in which interregional and interstate commodity movements are significant variables. Principal areas of this research are the following:

- (1) Spatial or locational problems.
- (2) Industry studies.
- (3) Demand and consumption studies.
- (4) Transportation problems.
- (5) Business operating decisions.
- (6) Regulatory programs.

It is clear that satisfactory commodity movement data must have many dimensions. The planning of a new highway program or wholesale market may require statistics on total tonnage and its seasonality without reference to commodity characteristics. Demand studies, on the other hand, require detail on a commodity basis. Research in interregional competition calls for information concerning commodity origins and destinations. Appraisals of the competitive character of markets may be strengthened by data showing channels of movement. In most cases, the principal value

of movement data is in their use with other information to enable an improved analytical examination of a problem or condition rather than in directly indicating economic interrelationships.

Information Now Available

In reviewing principal data available, it may first be observed that their principal aim usually is to serve administrative or regulatory ends, rather than research objectives.

Interstate Commerce Commission waybill sample

Perhaps the most extensive program to provide flow data on a continuing basis is that of the Interstate Commerce Commission which since 1947 has issued information showing carlot shipments by railroad in the United States based on a 1-percent sample of all waybills.

Essentially, a waybill is prepared by railroads in the ordinary course of business for each freight shipment and shows (together with an accompanying detail slip) a variety of information including: (1) Commodity shipped, (2) origin and consignor, (3) termination and consignee, (4) weight and routing, and (5) other subjects such as rates charged and equipment used. In recent years the annual number of rail shipments has approximated 30,000,000 which means that a sample of about 300,000 terminations is used. (The sample is based on terminations rather than origins although both are shown.) The universe from which this sample is drawn is all shipments terminated by Class I railroads. Such railroads account for perhaps 95 percent or more of the total tonnage of carlot freight shipments. In addition, the universe includes only carlot shipments (plus L.C.L. shipments weighing over 10,000 pounds), but these account for 98 percent or more of the total tonnage shipped by Class I railroads. There are 50,000 rail stations in the United States, and the 1-percent sample is drawn so as to reflect this universe.

From these data annual summaries are prepared showing for each of about 260 commodity classes (of which 78 apply to products of agriculture, including livestock, and approximately 15 others are for such products in more highly processed form), the number of carlots terminated in each State and the State of origin of each termination.¹ Intrastate shipments also are shown, as are shipments within and among the five freight territories.

These summaries essentially appear to have satisfied the original ob-

¹Difficulties arise in relating final termination to first origin in the case of shipments moving under intransit privileges, particularly in cases where product identity is lost. In some instances waybills prepared for shipments after intransit stopovers may show first origin under "transit notations" on the waybill, but this is inadequate for many purposes. Duplicate counting also arises in connection with intransit shipments; however, this affects only tonnage and not ton miles.

jectives of the Commission, and they have been employed for a variety of other purposes such as the Leontief interindustry studies, construction of freight rate indexes, and the measurement of circuitry in car movement.

The reliability of the sample in measuring number of carlots shipped for each commodity class can be tested in several ways, including that of multiplying the number of carlots reported by 100 and comparing the product with total shipments as reported separately. Such comparisons suggest that the sample yields estimates which have a standard deviation of about ± 5 percent for major commodity classes. A recent unpublished statement of the Commission concludes, "The inflated sample (100%) rarely agrees perfectly with the known controls, but it is also true that the sample does not differ greatly from the true value."

For a number of agricultural products, the reported terminations in particular States vary significantly from the true value.²

The 1-percent waybill sample, while covering only rail shipments, is a major source of information concerning interregional commodity flows. Nevertheless, for a considerable number of products, the transition from rail to truck shipment has been so pronounced as to make estimates derived from the waybill sample of little value in measuring market totals. Furthermore, its usefulness in agricultural production and marketing research has certain other limitations.

(1) *Limited detail by commodities.* Although the number of classes for agricultural products is 78, these represent consolidations of over 700 individual articles, even though specification in this detail is not necessarily shown on waybills. Thus, for many products the waybill sample does not provide separate information. Shipments of fresh beef, for example, are consolidated with shipments of 13 other types of fresh meats including pork. Butter and cheese are shown separately, but 7 other dairy products, including fluid milk and cream, are reported in a consolidated total. Approximately 30 commodities are reported separately. Individual waybills show commodity classification by general description, but these are coded to the 78 classes before machine cards are punched so that the job of deriving greater detail would be costly and is seldom done.

(2) *No data by seasons.* Only annual summaries are available showing interregional shipments.

(3) *Mixed carlots.* In reporting shipments which have products of more

² For example, the Market News Service of the U. S. Department of Agriculture reports rail unloads for 6 Ohio cities (based on complete reports from railroads), and thus probably covers a high percentage of rail unloads for the entire State. A comparison of this information for 9 fruits and vegetables for 1957 and 1958 with the expanded waybill sample shows a number of differences. In 5 instances (of a possible 18) the expanded waybill sample was less than the Market News total by more than 20 percent, and in 7 instances it exceeded the Market News total by more than 10 percent. In 6 instances, particularly for the items of major tonnage, the 2 series differed by less than 10 percent.

than one class, the classification is based on the commodity class represented by the largest weight. This difficulty, however, along with such problems as reporting errors characterizes all systems designed to measure traffic movement.

The material from waybills which is not published generally is not made available, although occasionally, on request, the Commission prepares special summaries. From time to time the Department of Commerce, with the approval of the Interstate Commerce Commission, prepares special summaries of waybill information at cost where this will serve the public interest.

United States Department of Agriculture data

The Department of Agriculture initiated its Market News work in 1915. Since that time, it has considerably expanded the information collected and issued regarding such variables as supplies of products reaching terminal markets and shipments from principal producing areas.

The principal characteristics of these data may be illustrated by the reports prepared for fruits and vegetables regarding shipments, receipts or unloads, and supplies in selected terminal markets.

Shipment data for fruits and vegetables. The Department reports shipments of various fruits and vegetables by State of production or assembly. In 1958, such data were reported for 40 products on a daily, weekly, and monthly basis. These reports are based on comprehensive information assembled concerning shipments by rail (including rail-truck) and for certain products by boat. In addition, incomplete information is obtained showing truck shipments from the more important shipping areas where it is feasible to obtain current data.

Unload data for fruits and vegetables. The Department prepares detailed monthly and annual summaries showing unloads of all fruits and vegetables by commodity, arriving by all means of transportation, for 25 of the more important terminal markets. For 13 additional markets, both rail and truck unload information is collected but is not reported in as much detail. In an additional 62 terminal markets, unload information is reported for movement by rail, and rail and truck unload data are obtained for 5 Canadian cities. In total, reports are available for 100 U. S. cities and 5 Canadian cities. Information is reported for 21 principal commodity classifications, of which 19 are for individual commodities and 2 for mixed commodity groups. The data show quantities of products unloaded by State of origin even though they might be moving under storage-in-transit privileges.³

This information does not fully reflect receipts by truck; however, an

³This source more fully identifies originating States than does the 1-percent sample, since some States necessarily are not included in the sample for any given traffic flow.

estimate is made of the percentage of completeness of the truck receipt data for each market, based on movements in wholesale commercial channels including receipts by chain stores.

Daily price reports often indicate additional information concerning variety and grade of receipts. However, this information is not summarized in monthly and annual reports.

Supply data for fruits and vegetables. For the purpose of indicating changes in market supplies, the Department issues daily summaries for 16 cities showing: (1) Sum of rail arrivals, (2) sum of cars on track (broken and unbroken), and (3) sum of truck unloads.

The completeness with which shipment and unload data are reported varies widely among markets and over time. For some markets the information perhaps is a better reflection of trends than of aggregates and in others the magnitude of unloads appears to approximate estimated consumption.⁴ It also is clear that data showing unloads have significantly greater reliability than those showing shipments.

In using these data to measure product quantity, allowance needs to be made for package weights and for changes in the average weight of carlot cargo. The incentive rates introduced by railroads in 1958, for example, have resulted in heavier loadings per car in some areas.

Data for other commodities. In addition to fruits and vegetables, reports are issued for other commodities, including dairy and poultry products, grain, livestock, and tobacco, although generally in much less detail.

For butter, receipts by rail and truck (usually separately) are reported at 12 terminal markets showing monthly totals by State of origin. A monthly report of carlot shipments to Pacific Coast States by State of origin also is issued. Comparable information is reported for cheese for 11 markets.

Similarly, monthly receipts at major markets by State of origin are reported for shell eggs, frozen eggs, live poultry, processed turkeys, and processed poultry.

The Department reports direct shipments by State of origin of cattle and calves and of sheep and lambs into 9 North Central States, and it also prepares a monthly report showing inspected stocker and feeder shipments of cattle and sheep from public stockyards, as well as receipts data for more than 50 livestock markets.

In evaluating the reliability of receipts and shipment data issued by the Market News Service, it is important to emphasize that the central ob-

⁴ For the years 1956 and 1957 reported unloads in New York City for 5 principal fruits and vegetables were in all cases except one at least 90 percent as large as estimated consumption and more often were larger than estimated consumption, as would be expected because of outshipments from the market.

jective has been to quickly assemble and disseminate information designed to be of immediate value to buyers and sellers, and usual sampling procedures often cannot be employed. Thus, it is important to evaluate the reliability of a particular report before determining its usefulness for particular research objectives.

Reported receipts of eggs in New York City, for example, equal only about 40 percent of estimated consumption in the city without allowance for outshipments,⁵ and a recent review of the report on egg movements into Chicago indicated that it was covering only about one-third of actual market receipts. This report has been substantially improved by the selection of a larger sample and the application of estimating procedures.⁶ In a number of other markets receipts data are under review.

Bureau of the Census data

In the early 1950's, the Bureau of the Census (Transportation Division) initiated what has developed into a series of studies to measure product movements by obtaining data from shippers' records. To date, reports have been issued showing domestic shipments in a specified year for (1) canned fruits and vegetables, (2) fresh fruits and vegetables, and (3) grain. Other shipper surveys in process include: (1) Livestock through terminal markets, and (2) a broader survey of canned foods.

Briefly, a probability sample of a specified type of processor or shipper is selected from Census information and data are then collected for a sample of the invoices or other shipping papers for each of the firms in the sample. These provide the basis for reports showing interregional shipments (on the basis of a 3- or 5-region break) for the commodity class selected, means of transportation used, distance shipped, and classification of receiving points by size.

Perhaps the most important aspect of this work is the development of techniques and procedures which could be applied in measuring shipments from other kinds of firms and for many other commodities. Most of the estimates developed showing divisions of United States totals have standard deviations of ± 5 percent or less.⁷

In their present state, the Census data have limitations for research purposes. Few commodity data are shown, either by kind or grade; seasonal patterns are not reported; and the data are available only for a

⁵ From unpublished material prepared by John O. Gerald, AMS, USDA.

⁶ A detailed report of this change will be issued by the Department: "Movement of Shell Eggs Into Retail Channels in the Chicago Metropolitan Area," Pedersen, John R., Mitchell, William L., and Pritchard, Norris T.

⁷ The methods employed are outlined in Church, D. E., and Jabine, T. B., *Method for Collecting "Traffic Flow" Data from Shippers*, Bureau of the Census, 1953.

particular year. Also, the information shows total shipments by establishments in the universe selected and not total terminations in the receiving areas. Thus, the report on fresh fruits and vegetables did not include receipts from (1) individual farmers or producer-shippers; (2) distributors who ship fresh fruits and vegetables as a secondary line; and (3) buying offices of (or warehouses owned and operated by) multiunit retail organizations. A rough comparison (necessarily so because aggregate data on truck movements are not available) suggests that the Census survey included only about 40 to 50 percent of total terminations.⁸ Obviously, such data are not yet appropriate for regional demand or consumption studies, for example, without considerable adjustment. For a number of other products, however, where there is a concentration of products for such purposes as processing at an early stage in the marketing process, data from shippers probably represent a much larger proportion of the total.

Shipments by water

Information is collected to show shipments of agricultural products by inland and coastwise water carriers, including the Great Lakes and the St. Lawrence Seaway. The Army Corps of Engineers issues reports annually showing tonnage shipped, together with information on origins from "shipping areas" and destinations by "receiving areas" for about 50 agricultural commodity classes. Data are not shown for specific origin and destination points or States but rather for harbors or areas which may include several States. Part of this information also is published in summarized form by the Maritime Administration.

The St. Lawrence Seaway Development Corporation publishes monthly data on general and bulk cargo movement on the Great Lakes, and individual commodity data may become available at the Corporation headquarters at Massena, New York.

The St. Lawrence Seaway Authority, with headquarters in Ottawa, also publishes limited material on bulk and general cargo movements on the Great Lakes and through the Welland Canal, and more comprehensive data with respect to the commerce on the Welland Canal and on the St. Lawrence River are issued by the Dominion Bureau of Statistics.

Other sources

Other sources provide data concerning interregional and interstate product movements but on a less comprehensive basis than those described in the foregoing.

Since the 1930's, the marketing of milk in a number of cities or met-

⁸ The difference is in fact smaller, as the multiple handling of produce by railroads results in a total tonnage of terminations which is larger than shipments by assemblers.

ropolitan areas has been conducted under provisions of Federal milk orders. The number of orders now is 76, and they apply to over one-half of total U. S. milk production eligible for fluid consumption. In the administration of these orders, information about market receipts and disposition of milk is collected to verify minimum payment requirements. The type of information required to be reported by handlers varies with each order, and in many cases complete geographic data cannot be released for individual markets because of their confidential character. However, there are some Federal milk order markets for which inshipments and out-of-market movements of milk are available.

Bills of lading executed by railroads for each shipment at times have been used to measure product movements since they may provide a little greater detail with respect to commodity quality and other characteristics than do waybills. However, such information has not been summarized systematically as have the waybill data. Bills of lading may not show certain data, such as weight of shipment and transfer costs, as accurately as these are shown on waybills.

One of the most detailed reporting systems for movement by truck is that maintained in California for fresh fruits and vegetables. All inbound and outbound truck shipments through California border stations are recorded and monthly and annual summaries are prepared. These show the quantity shipped to or received from each State each month for more than 30 products.

The U. S. Bureau of Public Roads reports total truck traffic, but without commodity distinction. Several railroads issue daily "passing reports" showing carloads of perishables moving through a given station. Various State regulatory agencies compile reports concerning traffic tonnage and equipment, as do certain transportation associations and industry agencies as in the shipments of certain Western deciduous fruits. Considerable research use has been made of the brand inspection records maintained in many Western States pertaining to cattle shipments.

The largest sources of information used in research to show interregional commodity movements are the special studies conducted by research personnel using the data. Recent projects concerned with cattle shipments, the marketing of feed grain, broilers, frozen foods, dressed beef, eggs, and other commodities have been based largely, if not entirely, on primary data collected for the specific project. This is perhaps the clearest basis of indicating the limitations for research purposes of the information now regularly collected.

Future Improvements

There are three major possibilities for improving information showing interregional product movements. These are:

- (1) Collect additional data regarding shipments by truck;
- (2) Develop a systematic program of shipper surveys including expanded commodity and functional coverage; and
- (3) Develop receiver surveys generally comparable in nature to present shipper surveys.

The principal area where improvement is needed is in the coverage of shipments moving by truck. Probably no more than one-half of present interregional and interstate shipments of agricultural products move by rail, with trucks, of course, accounting for a major portion of the balance. Perhaps one-half of total truck movement is accomplished by trucks owned by the buyer or seller or by other motor carriers not subject to economic regulation by the Interstate Commerce Commission. Consequently, no reports regarding traffic movement are obtained from them by the Commission.

The Bureau of the Census has concluded that expanding coverage of movement by truck is not a promising method of improving information showing total traffic flow.⁹ While trucking companies could increase their recordkeeping so as to have generally reliable data on traffic movement, the Bureau has not been able to develop a satisfactory way to consolidate these data with those from other carriers to obtain satisfactory traffic flow totals. Commodity classification difficulties, overlapping reporting, and other factors pose hard-to-resolve problems.

On the other hand, better information on truck shipments—although perhaps costly to assemble—would be useful even though it could not be used in constructing completely satisfactory totals of movements by all means of transportation. The growing importance of private trucks—even for hauls of several hundred miles or more—means that data in addition to those from commercial haulers would be needed if satisfactory trucking totals are to be had.

A comprehensive census of the motor carrier industry, as is authorized in the Census statutes—although financing has not been provided—would furnish an important basis for the development of adequate statistics of commodity movement by the motor carrier industry.¹⁰ There is also some prospect that freight bill data could be collected regularly from companies operating regulated motor carriers and that a separate sample could be developed for unregulated motor carriers. The sampling of freight bills for commodities moving by certain types of trucks has been attempted by

⁹ "Measuring Transportation Market Potentials," Church, Donald E., March 1959.

¹⁰ The Interstate Commerce Commission presently receives reports of tonnage shipped by common carriers. However, it has no freight bill sample comparable to the waybill sample of rail shipments. Furthermore, the 725-750 trucking firms now reporting account for only a portion of truck shipments—substantially less than one-half of agricultural commodities, many of which are in an exempt status.

nongovernmental agencies on past occasions and is reported to have produced adequate and accurate results.¹¹

In some cases receivers' records provide a useful basis for determining product movements. Grain movements, for example, typically are interrupted two to three times with the result that the identity of the original shipment is lost. Consequently, more useful data may be obtained from feed manufacturers or other receivers than from shippers. Generally, however, shippers have proven a better source. Receivers usually constitute a more diverse universe, and shippers appear to maintain better and more readily available records concerning product movements. Also, the shipping papers in the custody of receivers may not show origin and type of carrier if freight is prepaid.

An expansion of information collected from shippers may provide a practical way to measure shipments of some commodities. The Bureau of the Census is now developing a procedure for collecting material by mail questionnaires comparable to that in its present shipper surveys. If successful, this procedure would represent a marked improvement, although shipments of secondary products and lack of knowledge on the part of shippers as to where some shipments terminate would still constitute problems.

Reports presently are not available showing shipments of freight by air. Bills of lading, of course, are executed in connection with such shipments, and the limited number of carriers in this field should make the use of an airbill sample quite feasible.

In some instances, the best present method for developing product flow data may be through the employment of a consumption function or model which provides a basis for estimating inshipments needed to augment local production. This method probably yields better results than can be derived from some of the product movement data now reported. Nevertheless, this is a temporary expedient. Estimated flow patterns and magnitudes, when compared with empirical evidence, frequently require modification for market imperfections or other forces improperly reflected in the estimating method. Improved product movement data, rather, should enable significant improvement in the validity with which estimating procedures can be employed.

In the years immediately ahead, those requiring more comprehensive data on interregional commodity flows than are now being issued in many

¹¹ Also, the Canadian Government beginning in 1957 has measured commodity movements by truck, as well as related data, from a sample of carriers drawn from truck registrations. Information is obtained by mail questionnaire in which the selected respondents report truck usage for a specified period of time. This experience may be useful in comparing alternative methods that might be employed in the U. S. (Dominion Bureau of Statistics, "Motor Transport Traffic Statistics National Estimates-1957," Ottawa, 1959.)

cases will need to assemble such information directly from primary sources.

DISCUSSION: DATA FOR INTERREGIONAL STUDIES

A. ROBERT KOCH

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Upon first reading the papers by Drs. Burk and Finner I was impressed by the treatment given the broad topics of regional food consumption and agricultural product trade flows. From the presentation, I gained the feeling that the subjects were discussed with "authority by authorities."

The general presentation of material in Burk's paper, which included purposes of regional consumption analysis, appraisal of available data, uses of those data, and development of long-term objectives and programs regarding regional data, adequately reflected the accomplishments, opportunities, and problems associated with analysis of regional food consumption.

The sources of data needed by analysts working with spatial or locational problems, demand and consumption studies, transportation problems and regulatory programs, and the extent of detail associated with such data were described clearly and comprehensively by Finner.

I think of several specific instances where data described in the papers would prove invaluable in analyzing specific economic problems confronting researchers on the state or regional level. The first such instance pertains to Burk's stated purpose of developing food consumption estimates to back up market development programs for major foods. In some states, governmental and agricultural groups are considering or have recently instituted broad promotional programs directed towards the increased consumption of major foods and individual food items. With such state and group programs, questions invariably arise regarding the feasibility and effectiveness of the promotional outlays as a means of increasing the consumption of food items which are produced in the specific region and other regions as well. Has there been a favorable demand trend for the product or group of food items? What about the consumption trend of competing products? What income groups should the promotion be aimed at? What states or regions normally supply the consumption needs of the product in question? Both broad-gauged and precise consumption data on a regional and subregional basis as well as origin and receipts data would help to formulate answers to the above questions. I believe that much of the promotional activity dealing with groups of foods and individual foods has been undertaken without first studying consumption and distribution data, as broad or meager as this information may be.

The second instance refers to one area of research stated by Finner,

namely, spatial or locational problems, and illustrates a further use of available information on food consumption.

Much research effort is being expended on problems dealing with inter-regional competition. Several studies in this area have used the transportation model of linear programming as the analytical technique to answer questions pertaining to location of production and processing firms and the optimal movement of goods from surplus to deficit regions. Briefly, the linear programming transportation model is concerned with the movement of goods from given supply points to given consumption points where the supplies at the production points, needs at the consumption points, and transportation costs between the production and consumption points are predetermined. Thus, three sets of data are needed: production data, consumption data, and transportation rates. Production data are available from a variety of sources, a few of which are the U.S.D.A. reports concerning farm production, disposition and income for certain products; trade associations, both nationally and on a state level (National Canners Association, and state canning associations); and state crop reporting services. Accumulating regional consumption data poses a more formidable problem; however, the 1955 study of household food consumption forms a basis from which to develop meaningful state consumption estimates.

Estimating Consumption by States

If the limitations of the 1955 regional data are kept in mind, the following method should prove useful to calculate differences in subregional food consumption for specific products:

1. Weekly regional household food consumption data published by income group, for all urbanizations, are placed on a per capita basis.
2. A regression line correlating weekly regional per capita consumption and income is calculated for each product.
3. The mean income of each state is calculated.
4. Computed weekly regional per capita consumption from the regression line is associated with the mean income of each state within the region. Weekly regional per capita consumption, corresponding to a state's mean income, is the weekly per capita consumption within the state.
5. Weekly state per capita consumption is converted to yearly state per capita consumption.
6. Multiplying by the state's population yields the total state consumption estimate.

After the state production and consumption data are assembled, state production-consumption balances are determined. The analysis of state

production-consumption balances and related data such as incomes and degree of urbanization is valuable in itself. Such analysis pertaining to canned tomatoes and tomato products further substantiates the expectation that food sales per capita in the south will increase as incomes, social factors, urbanization and institutional patterns change.¹ However, by using linear programming techniques, production-consumption balances for individual foods not only are useful to determine where expanded regional consumption can be expected, but also indicate which surplus producing region or regions can most effectively satisfy the consumption needs. For example, states with a positive production-consumption balance (production exceeds consumption) are designated as surplus or exporting, and states with a negative production-consumption balance (consumption exceeds production) are designated as deficit or importing. The transportation model matrix is formulated using net production-consumption balances and transportation costs. The resulting matrix solution yields optimum (least cost) distribution patterns for the product in question. These patterns and other data generated by the solution are, in turn, compared with historical distribution patterns, prices, and costs in order to answer questions regarding the location of production and efficiency of distribution within the specified industry.

Thus, in a study dealing with interregional competition using linear programming techniques, many of the pertinent data discussed by Drs. Burk and Finner are required. Precise subregional data for individual commodities are needed for use in the linear programming transportation model. Data from one-time household surveys can form the basis of the state consumption estimates. Historical consumption and distribution disappearance type data are needed for purposes of comparison with the model solutions. Census data for the food and kindred products industry can be used to show regional trends in the size and distribution of food processing establishments. If data are available, the transportation model can be modified to show consumer preference, grade differences, and advertising, among other factors, that approach an imperfect market. An example of these data are the special surveys pertaining to the regional distribution of nationally advertised brands. From these data inferences and estimates concerning the regional consumption of nationally advertised versus nonadvertised food products can be developed.

I heartily agree with the assertion, "We now have the necessary data to do far more regional analyses than we have attempted." Before accumulating vast quantities of regional data, let us be sure that we have gleaned all possible information from existing data.

¹ *Interregional Competition in the Tomato Processing Industry*, A. R. Koch, Unpub. Ph.D. Dis., Purdue University Agr. Expt. Sta., West Lafayette, Ind., 1959.

As new research tools and techniques are developed to analyze the problems of agricultural and marketing adjustment, let us effectively use the available information on regional food consumption and interstate and interregional trade flows and then make our desires known to fill the existing voids.

DISCUSSION: DATA FOR INTERREGIONAL STUDIES

VINCENT I. WEST

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I have enjoyed and profited from the reading of both of these interesting and informative papers. (Also, in case anyone thinks it never happens, I should say that they were both supplied to me at approximately the time the chairman specified in planning for this session.)

Titles

I hope that I may be forgiven for starting the discussion with a minor dissatisfaction. That is, with the titles of these papers. I can imagine a generation of students finding these papers listed in periodical indexes (without the session title) and thumbing through the *Journal* in hopes of finding tables showing trade flows or food consumption. If their disappointment at finding no tables is not too keen, they will find such tables in some of the literature cited, and much information in these papers.

Scope

The subjects considered in these two papers obviously overlap to some extent, but they are largely complementary. Much of the trade flows considered are in farm food commodities.

Conclusions

I believe that the conclusions of the two papers are not entirely in agreement. The differences are, perhaps, only due to the different objectives.

Miss Burk concludes: "We now have data to do far more regional analyses than we have attempted." Mr. Finner concludes: "In the years immediately ahead, those requiring more comprehensive data on interregional commodity flows than are now being issued in many instances will need to assemble such information directly from primary sources."

I recognize that these statements are not necessarily in direct conflict. I am certain that each is correct, but they emphasize very different aspects of the problem (or I should perhaps say problems).

Each of these points of view has served as a stimulus to analysis and data collection by people in the various states and regions.

The collection of data from primary sources is expensive and difficult, and the data collected by regional committees has, consequently, not always been as uniformly collected or as complete as is needed.

The attempt to use the available data has led to some analyses which might cause one to take a position opposite that of Miss Burk; namely, that we lack data to undertake some of the regional analyses that have been attempted. In this category are attempts to derive regional demand functions for spatial models in which resort has had to be made to assumptions of equal elasticities among regions.

The estimates of food consumption to which Miss Burk refers, based upon the 1955 surveys, and data from private research firms will help, but the lack of regional time series on consumption of foods and on consumption expenditures in general continues to be a serious handicap to the study of regional demand functions.

In this connection I should like to point out that the data on trade flows and on food consumption are better than the data available on many other categories of consumption expenditures. (These are not the subject of the papers here.) Data on expenditures for services are extremely inadequate on state and regional bases, but are as badly needed for many studies as are food consumption expenditures. (I refer here to services generally and not to the food marketing services with which Miss Burk is concerned.)

We can only applaud the long-time program for regional analysis of food consumption. Miss Burk says, "Future demands can be met if we analysts demonstrate our wares effectively so that additional resources will be made available to supply both our data needs and the trained manpower to make the analyses." We hope she will not rely so completely on this supply function that she will fail to heed her own advice, "Would-be users of such data need to make their demands known rather than suffering in silence."

INTERSECTOR RELATIONS IN RURAL DEVELOPMENT

Chairman: M. E. John, Pennsylvania State University

INCOME IMPROVEMENT PROSPECTS IN LOW-INCOME AREAS*

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Agricultural Research Service

IF THE proverbial view that the poor will be with us always were applied to low incomes in American agriculture as an economic problem today, probably it would be widely discredited, as was its author nearly two thousand years ago. Nonetheless, there are reasons to fear that relatively low incomes will continue to persist on an extensive scale in much of American agriculture for a long time, not because the problem is insoluble but because it is much more complex than most of the proposed solutions imply. In this paper, I shall present my basis for this concern, hoping that thereby I can help to shift the course of low incomes that much of agriculture is on.

In this, I shall deal only with that part of the low-income problem resulting from economic underemployment, leaving the part that results from limited employment capacities and "noneconomic" values as problems for later economic analysis. By *underemployment* I shall mean the employment of a worker in a way that yields labor earnings below that received in other kinds of employment by workers of comparable ability and tastes, after making appropriate allowances for income differences that can be explained by differences between locations and kinds of employment, by differences in the purchasing power of money and in non-pecuniary advantages and disadvantages, by transfer costs, and by other conditions whose operation is consistent with perfectly functioning labor markets.¹ Because of their logical associations in the sense applied here, I shall use the terms *underemployment* and *low income* interchangeably. I shall assume that the widespread occurrence of underemployment in agriculture, especially in low-income areas, is an established fact. Hence our task will center on ascertaining what kind of economic problem underemployment poses in terms of its causes and requirements for solution.

* The ideas expressed in this paper are those of the author and do not necessarily correspond to the official views of the Farm Economics Research Division, ARS, or the United States Department of Agriculture.

¹ Such underemployment is referred to as "disguised unemployment" by Joan Robinson in her *Essays in the Theory of Employment*, The Macmillan Co., New York, 1937, pp. 82-101.

In economic theory, the remedy for underemployment, as defined, lies in a transfer of the underemployed labor from its present use into more remunerative kinds of employment until the earnings of comparable workers become equal in all uses. Conversely, the causes of underemployment must be found in impediments to such labor transfers. Most economists believe that the major labor transfers needed to correct the underemployment in agriculture are from farm to nonfarm employment rather than those involved in farm adjustments.² If this view is correct, our first concern should be with the impediments to farm-nonfarm labor transfers, keeping in mind that the opportunities for correcting underemployment through intrafarm adjustments may expand as the impediments to farm-nonfarm transfers are overcome.

Economists have long recognized the importance in developing adequate remedial programs for farm underemployment of ascertaining what are the impediments to movement by farm workers into nonfarm jobs in the numbers needed to achieve a farm-nonfarm income equilibrium. Most of them ascribe the excess labor and associated underemployment in agriculture to migration impediments that are indigenous to farm people, or to conditions affecting them as a supply of nonfarm labor rather than to labor market imperfections that restrict the nonfarm labor demand.³

Farm workers' limited knowledge of nonfarm jobs and lack of enough capital to move into nonfarm employment are the impediments most frequently mentioned as posing economic problems. In this view, the requirements for correcting the underemployment in agriculture are relatively simple. Normally, better labor-market information and credit funds for moving, as envisioned in the policy proposal called *Homesteads in Reverse*, would be a sufficient remedy. Improvements in economic education to inform people about the "correct" nature of the farm income problem⁴ would soon lead to such a policy, except for local self interests.

In support of this simple thesis, it can be proved that many farm people have very little capital and limited knowledge of nonfarm jobs. But at worst, are these limitations any more than the results, or the symptoms, of much more deeply rooted impediments to labor transfers? More pertinent is the question, how can one explain chronic underemployment and the low income associated with it as general economic phenomena—

² T. W. Schultz, "An Alternative Diagnosis of the Farm Problem," *J. Farm Econ.*, Dec. 1956; Kenneth E. Boulding, *Principles of Economic Policy*, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1958; *Policy for Commercial Agriculture*, Panelist Papers, Hearings, Joint Economic Committee, 85th Cong., 1st Sess., Nov. 22, 1957; Marion Clawson, "Agricultural Adjustments Reconsidered: Changes Needed in the Next 25 Years," *J. Farm Econ.*, May 1958.

³ Schultz, *op. cit.*; D. Gale Johnson, "Functioning of the Labor Market," *J. Farm Econ.*, Feb. 1951.

⁴ Earl O. Heady, "Progress in Adjusting Agriculture to Economic Change," *J. Farm Econ.*, Dec. 1957, pp. 1346-7.

whether in farm or nonfarm areas or whether small or large in extent? Having explained underemployment as a general economic phenomenon, why is agriculture, particularly in lower income areas, more subject to its incidence than are other parts of the economy? Answers to these questions are basic to understanding the causes of low incomes in agriculture and to appraising alternative solutions and prospects of soon eliminating widespread low incomes in the Nation's poorer farm areas. They are therefore taken as the major problems of this paper.

Economic Conditions Consistent With Underemployment

The task of indicating the economic conditions that permit underemployment in simplest terms is that of explaining why wage differences persist in the same general labor market among workers who are equal in ability and willingness to work. In its most severe form, this problem is that of indicating why, among such workers, some have well-paying jobs while others are involuntarily unemployed. Hence the primary causes of underemployment, whether in the farm or nonfarm economy, or whether small or large in extent, can be defined by a reference to general employment theory.

Underemployment and the competitive model

A suitable point of orientation for examining the causes of underemployment is provided by the model of a perfectly competitive economy—i.e., one in which (1) there are no externally imposed restrictions to the movement of factors by their owners in search of the most remunerative employment, and (2) there is no decision-making unit that by its own actions can affect the price of what it buys and sells. The first question that we must answer is, can chronic underemployment persist in such an economy? If underemployment cannot persist in such an economy, then we must look to deviations from a perfectly competitive economy rather than to knowledge and capital limitations for its explanation.

Before the appearance of Keynes' *General Theory of Employment, Interest and Money*, most economists would have answered this question, especially as applied to involuntary unemployment, in the negative. In their view, the great virtue of a competitive economy was that under competition, the price mechanism could coordinate as with an "invisible hand" the activities of millions of workers, most of whom act with limited knowledge of markets and with a high degree of independence in many different and widely separated places and produce many kinds of goods and services.⁵ With few exceptions, economists had long ignored under-

⁵F. R. Fairchild, E. S. Furniss and N. S. Buck, *Economics*, The Macmillan Co., New York, 1937, pp. 67-71. See also Ezra Taft Benson, "Foreword," *Marketing: The Yearbook of Agriculture*, 1954, U. S. Dept. Agr.

employment, especially involuntary unemployment, because they believed (1) that the real economy conformed closely to the competitive model; and (2) that competition minimized the ill effects of individual limitations of knowledge and capital, making them of little practical significance as impediments to the efficient allocation of resources.

Why then do some students of the farm income problem contend that limited knowledge by farm workers of their nonfarm job alternatives and limited capital with which to move are *primary* impediments to farm-nonfarm labor transfers? A likely answer is this: the knowledge needed to maximize resource earnings—often referred to in economic literature as *perfect knowledge*—has been listed so frequently as a prerequisite of the competitive ideal that they have failed to note that such knowledge is not a precondition but a logically necessary result of perfect competition.⁶ Hence the failure of workers to move into better jobs merely because they lack knowledge of them is *prima facie* evidence of limitations in competition both among workers for jobs and among employers for the available supply of labor. If underemployed farm workers could always obtain nonfarm jobs by offering to work for wages not exceeding the marginal productivity of their labor, as predicated in competitive theory, knowledge limitations now observed would be broken down through their more actively seeking nonfarm jobs. But uncertainty about opportunities for a job of any kind often inhibits their seeking. Such uncertainty would never be soundly based if nonfarm labor markets always conformed to the competitive model. Nor is it likely that in such an economy, such uncertainty by farm workers would exist to a significant extent.

That the failure of workers to move because they lack knowledge of job opportunities evidences limitations of competition among employers for labor becomes clear when we reflect that if the economy were perfectly competitive farm underemployment would mean that nonfarm employers are paying more for labor than comparable labor from farms would cost if they would recruit this labor, equating marginal costs and returns of such recruitment as for other operations. In other words, in a competitive economy, underemployment in agriculture is impossible without at the same time underemployment of the management and capital resources of nonfarm employers. Under competition, such a condition would correct itself. Nonfarm employers would have to engage in labor-recruitment

⁶F. A. von Hayek, "Economics and Knowledge," *Economica*, February 1937, p. 42; Paul H. Douglas, *The Theory of Wages*, The Macmillan Co., New York, 1934, p. 69; E. J. Working, "The Objectives of Economic Control," *Economics, Sociology and the Modern World: Essays in Honor of T. N. Carver*, Harvard Univ. Press, Cambridge, 1935, p. 59; Milton Friedman, "The Methodology of Positive Economics," *Essays in Positive Economics*, Univ. of Chicago Press, Chicago, 1953; George J. Stigler, "Perfect Competition Historically Contemplated," *J. Pol. Econ.*, Feb. 1957.

activities both to maximize incomes and for competitive survival.⁷ Through these recruitment activities and competitive bidding, they would extend to underemployed workers on farms (as well as to those elsewhere) the knowledge they need to choose their most remunerative employment. In these recruitment activities, it would be to the interest of nonfarm employers also to finance to the extent needed the movement by farm workers into nonfarm employment, equating the marginal costs and returns for this activity as for other operations. No other result seems consistent with a perfectly competitive economy.

Hence the survival of nonfarm employing firms without the continual seeking out of cheaper labor can mean only either (1) that equilibrium is being achieved; or (2) that nonfarm employers cannot or will not hire labor at lower wages than they are now paying because of deviations from the characteristics of a fully competitive economy. The first of these possibilities is precluded by the fact of underemployment in agriculture as well as by that of involuntary unemployment in the nonfarm economy. Therefore, the underemployment and the related low income in agriculture must result from market characteristics that limit competition.

Underemployment under deviations from perfect competition

The question thus arises, what market imperfections impede farm-nonfarm migration and help to widen the farm-nonfarm income gap? In economic logic, the idea that farm price supports could do this is a contradiction of terms. What then of administrative pricing in nonfarm product markets? The answer is that administrative pricing in product markets can lead to a lower general level of employment and labor earnings than would otherwise prevail. But with perfect competition among workers for jobs and among employers for labor, imperfections in product markets cannot in themselves cause differences in labor earnings among workers of comparable ability and tastes.⁸ Underemployment and the low income resulting from it can persist only if there are first imperfections in the labor market that impede the movement of workers from lower to higher income occupations. Given such imperfections in the labor market, then imperfections in product markets can accentuate underemployment in the economy by restricting production and employment in the higher-wage industries and forcing more of the Nation's

⁷ B. H. Luebke, and J. F. Hart, "Migration From a Southern Appalachian Community," *Land Econ.*, Feb. 1958. Major employers regularly recruit and pay moving costs of workers in short supply, like physicists, chemists, mathematicians, and engineers.

⁸ Carrie Glasser, *Wage Differentials*, Columbia Univ. Press, New York, 1940, pp. 126-128.

workers into the more competitive, lower-wage occupations⁹ or into the ranks of the unemployed.¹⁰ Furthermore, as competitive sectors of the economy shrink in relative importance, workers remaining therein can be subjected to increasing underemployment even when underemployment is decreasing in the Nation as a whole.

In the literature on labor market imperfections, two major classes of labor transfer impediments are commonly named: (1) externally imposed or institutional barriers, such as long apprenticeship requirements, high trade union membership fees, and discrimination by employers or trade unions against workers of given geographic or ethnic origins or against those of particular ages, educational levels, or physical characteristics; and (2) wage policies resulting in wages that cannot be maintained without restrictions on the number of persons employed. Of these, wage policies appear to occupy the *primary* role,¹¹ with other impediments related to wage policies as means or results. For example, wage policies—by permitting a supply of labor that is larger than the demand—enable employers to discriminate in the selection of workers beyond normal job requirements. Meantime, they provide employed workers incentives to support restrictions on the freedom of entry into their respective occupations. Therefore, while wage policies are *primarily* responsible for underemployment in the economy, other impediments help to determine which workers and which parts of the economy bear most heavily the resulting underemployment. Wages which permit the supply of labor to exceed the demand may persist, not only because of employee policies, but also because of the wage policies of employers and those of society at large.

Relevant to the issue of this paper, however, is the fact that underemployment is impossible without labor policies that permit the supply of labor in the higher-wage industries to exceed the demand.¹² It is this resulting excess in the supply of labor over the demand that is the definitive characteristic of underemployment wherever it occurs and whatever its extent.

Conditions that make agriculture vulnerable to underemployment

Given the conditions that permit underemployment, the question remains, why is agriculture, especially that in low-income areas, more subject to bearing its incidence than are other major parts of the economy? Here are at least three main reasons.

⁹ J. K. Galbraith, *American Capitalism: The Concept of Countervailing Power*, Houghton Mifflin Co., Boston, pp. 109-110.

¹⁰ Robinson, *op. cit.*

¹¹ Simon Rottenberg, "Wage Effects in the Theory of the Labor Movement," *J. Pol. Econ.*, Aug. 1953.

¹² Albert Rees, "Wage Determination and Involuntary Unemployment," *J. Pol. Econ.*, Apr. 1951.

1. The most important is that in its labor market agriculture is a highly competitive industry within a larger general economy that is characterized by significant deviations from the competitive model. Agriculture conforms closely to the classical competitive model in both freedom of entry and flexibility of labor earnings. Its laborers consist of two main classes: (1) self-employed workers and members of their families; and (2) workers employed on a wage basis. Restrictions have seldom, if ever, been placed on the entry of qualified wage workers into agricultural employment. The only restrictions upon entry as self-employed workers is that imposed through capital markets. In much of agriculture, very little equity capital is needed to become a low-income farmer. This is especially true in most of the South and in many other localities where both productivity and value of the land is low. This fact may help to account for the close association in American agriculture of low incomes with poor land areas. But the large underemployment in the Mississippi Delta and the lack of extensive underemployment on rangelands of the West, where nonland capital requirements for entering farming are high, make it evident that it is not poor land *per se* that accounts for its frequent association with extensive underemployment. Instead, the reasons lie in impediments to the entry of labor from such areas into nonfarm employment and in the ease or difficulty, as the case may be, of its entry into agriculture.

With its competitive features, agriculture, although declining in relative importance, is rapidly being left as the Nation's only major industry with characteristics that permit rapid absorption of large amounts of underemployment. Thus, like the lower end of a lake whose upper part is being filled in, agriculture could have been subject in recent decades to a rising groundswell of underemployment even had underemployment been decreasing in the Nation as a whole. With the Nation's total underemployment increasing as it has done in recent recession periods, or even since the end of World War II, agriculture has been doubly exposed in recent years to underemployment conditions.

2. The second major reason why agriculture is highly subject to bearing the incidence of the economy's underemployment lies in the selectivity processes through which underemployment is distributed. If a competitive labor market were agriculture's only disadvantage, farm workers could compete for new job openings in nonfarm industry on equal terms with workers of nonfarm origins. Thereby, they could distribute underemployment more equally between themselves and workers of nonfarm origins. But a supply of labor that exceeds the nonfarm demand (1) permits increased selectivity, or discrimination, in the hiring of workers on the basis of their age, education, physical condition, ethnic and geographic origins, heterogeneity considerations, and other factors; and (2)

yields a large advantage in obtaining jobs to workers who are the most accessible to them.

Relatively large percentages of the Nation's underemployed farm workers, especially in lower income areas, are above the upper age limit and below the educational and physical standards used by many nonfarm employers to screen job applicants except in periods of a rapidly growing labor demand. The major competitors to farm workers for new nonfarm jobs are (a) currently employed nonfarm workers seeking better jobs, (b) new nonfarm labor-force members, and—in periods of large unemployment—(c) unemployed nonfarm workers, many of whom have job seniority rights. Most new nonfarm labor-force members are young adults who have recently completed their formal education, often with trade school training designed to help them meet entrance requirements of the specific jobs for which they apply. The other groups have a background of relevant experience and skills and seniority rights, which few farm workers possess.

The greater distances of farm people from urban and industrial centers, sometimes associated with large cultural differences, make farm workers less accessible to newly opening nonfarm jobs than are their nonfarm competitors. In a fully competitive economy, farm workers could always obtain nonfarm jobs merely by offering to work for wages not exceeding the value productivity of their labor. But when the supply of labor exceeds the nonfarm demand, differences in the distance at which workers live from newly opening jobs helps to determine which ones obtain these jobs and which remain underemployed. Hence, it has been commonly observed that underemployment is most extensive at the peripheries of urban-industrial areas of influence and that it decreases as the centers of such areas are approached. Such observations have recently led to the thesis that the income disparity among farm communities and areas results mainly from differences in their location relative to urban and industrial centers.¹³ Although the facts used to support this thesis are undeniable, its explanation commonly rests upon an inadequate logical basis or upon the kind of empiricism that carried to its logical limits would require developing nonfarm industry in each rural community to eliminate rural poverty. Notwithstanding the authority to the contrary implied in recent literature, a perfectly competitive economy does not function better at its center than at its periphery; it functions equally well throughout all of its parts. Based on the competitive model, there is no reason why the labor-income benefits of economic progress are not widely

¹³ T. W. Schultz, "Reflections on Poverty Within Agriculture," *J. Pol. Econ.*, Feb. 1950; A. M. Tang, *Economic Development in the Southern Piedmont 1860-1950—Its Impact on Agriculture*, Univ. of N.C. Press, Chapel Hill, 1958.

diffused to all of the economy through trade and resource movements. Distance could make a difference equal only to transfer costs. It could never account for underemployment, nor prevent workers in all parts of the economy from sharing through allocative and pricing processes in the benefits of economic progress.

But given market structures that permit the supply of labor available for nonfarm jobs to exceed the demand, the distance at which workers live from the centers of economic development helps to determine which localities and which workers bear most heavily the incidence of the economy's underemployment. But it is the demand for labor relative to the supply, and not distance *per se* or cultural differences related to distance, that is of crucial importance to farm-nonfarm labor transfers. Given good nonfarm job prospects, farm workers as a class are highly mobile. Within the last two decades, when there has been a rapidly growing nonfarm demand for labor, they have moved by the millions, many times breaking home and community ties and moving hundreds of miles away.

3. Finally, agriculture, especially in low-income farm areas, is highly vulnerable to underemployment because of (a) its large natural labor increases and (b) its declining labor needs as a result of farm technological advances and market limitations. But large natural labor increases, rapid farm technological progress, and a low elasticity of demand for agricultural products are not alone sufficient to explain the underemployment and low per capita income in agriculture. These conditions make it necessary that each year a large number of farm workers move into nonfarm employment to achieve and maintain a farm-nonfarm income equilibrium. But except for labor-transfer impediments, no one nor any combination of these conditions could lead to excess capacity and to a low per capita income in agriculture. Rather, a low farm income can result from technological advances and limited farm-product markets only because agriculture is a highly competitive industry in a world heavily dominated by monopolistic and oligopolistic market structures. Given these market structures, farm technological advances have been and will continue to be, even in the long run, a source of considerable instability that constantly presses down farm incomes. But it is in its labor market and other competitive characteristics, and not in rapid technological advances relative to market growth—nor in the atypical values and knowledge limitations of its workers—that agriculture is unique among the Nation's major industries.

Summary and Conclusions

In summary, the above thesis, if valid, has many important implications for the income problems of all of agriculture and especially of agriculture in the low-income areas. It raises doubt as to the possibility of ever

solving the income problems of agriculture merely by turning farmers back to free market prices. It casts doubt also upon the value of programs directed only toward helping farm people move more rapidly than they would otherwise do into the nonfarm economy. For unless such a program is combined with measures that increase the nonfarm demand for labor, it could correct underemployment in agriculture only by transferring it to the nonfarm economy. This would be likely to mean a transfer into the public sector as increased unemployment, making such a program indeed one of *Homesteads in Reverse*.

It follows from the thesis of this paper that *the problems of (1) excess capacity and income instability in agriculture as a whole, (2) underemployment and low incomes in agriculture's lowest income areas, and (3) urban underemployment and unemployment are much alike in principle*. They differ as do areas of various depths in a lake, with the lowest-income farms occupying the areas of greatest depth, becoming the first to fill with underemployment, and remaining the last and the most difficult to drain.

As thus depicted, the income and employment problems of agriculture—both of agriculture as a whole and of that in lower incomes areas—cannot be solved by intrafarm adjustment and labor-transfer programs alone. These measures have their place. But our farm income problems are so closely related to the problems of economic growth, full employment, and wage and price stability in the whole economy that low-income farm policy, as well as the income policy of agriculture as a whole, needs to be developed increasingly as an integral part of the Nation's general economic policy.

Conceptually, solutions of the low-income farm problem are possible along either or a combination of three lines: (1) a program of positive *laissez-faire* to break down labor-market imperfections;¹⁴ (2) measures, as through monetary and fiscal policies, to achieve and to maintain full employment despite labor-market imperfections; and (3) a program of comprehensive supply controls in commercial agriculture¹⁵ coupled with income transfers to the Nation's underemployed farm people whose underemployment cannot be corrected through such controls. Each of these possible solutions poses a difficult policy alternative because of both (a) its economic complexity, and (b) the deeply rooted value conflicts to which it gives rise, which value conflicts are analyzed in Brewster's paper elsewhere in this *Journal*.¹⁶ Hence low incomes, underemployment, and excess

¹⁴ Henry C. Simons, "Some Reflections on Syndicalism," *J. Pol. Econ.*, March 1944.

¹⁵ Willard W. Cochrane, *Farm Prices: Myth and Reality*, Univ. of Minn. Press, Minneapolis, 1958.

¹⁶ John M. Brewster, "The Impact of Technical Advance and Migration on Agricultural Society and Policy," p. 1169.

farm capacity are likely to persist as serious economic problems, not only in the Nation's poorer farm areas but as characteristics of agriculture as an industry for a long time to come. In particular, barring a large upturn in the rate of national economic growth sufficient to absorb rapid technical advances in both the farm and the nonfarm economy and to absorb the large upsurge in the Nation's labor supply that is expected in the 1960's, they are likely to become increasingly acute in the decade immediately ahead.

As students of the economics of agriculture, we may help to forestall such results by diverting more of our research resources to the study of national income, growth, and employment problems as these problems relate to agriculture. In this, we shall need to make use of economic models appropriate to a general economy made up of multivariate market structures¹⁷ ranging from perfect competition to pure monopoly and monopsony instead of one patterned throughout only along classical competitive lines or only along lines of one or more of the various classes of imperfect competition. Furthermore, our models must be appropriate to a modern economy in which the solutions of many major economic problems are not uniquely determined by impersonal forces but are worked out through negotiation and bargaining by rival interests in public and private councils.

¹⁷ Heinrich V. Stackelberg, *The Theory of the Market*, William Hodge and Co., Ltd., London, 1952, pp. 215-236.

EMPLOYMENT AND UNDEREMPLOYMENT OF RURAL PEOPLE IN THE APPALACHIAN AREA

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WHEN our President, Ray Bressler, asked me to prepare a paper dealing with "employment and underemployment of rural people," I knew at once that this subject was too big for me to handle. He agreed that I should limit my paper to a discussion of the employment and underemployment situation in the Appalachian Area. As I have attempted to prepare this paper, there have been times when I have thought that, even with this limitation, I included too large a geographic area. I have further hesitations in discussing this subject because of the difficulties of measuring underemployment. One of the most scholarly discussions of the subject which I have found is a paper written by Charles E. Bishop and published in the May, 1954, issue of the *Journal of Farm Economics*.¹ He says:

To determine whether labor is underemployed the relevant real income data must be expressed in levels of satisfaction rather than in terms of a particular bundle of goods and services. Underemployment of labor exists when the level of utility available to resource owners as a consequence of employing their labor in a particular use is less than the level of utility available to them by employing their labor in alternative uses.

The measures of underemployment which I use in this discussion will not meet the test of this sophisticated definition. In his conclusions, Bishop says:

If the definition of underemployment used in this paper is accepted, one cannot say on the basis of available data whether labor is underemployed in agriculture in the Southeast.

By the same token, we cannot say with certainty whether labor is underemployed in agriculture in the Appalachian Area. But, by using a less exacting standard of measure than this proposed by Bishop, we think that large numbers of rural people in the area are underemployed.

Census and other official reports on employment are not very useful in portraying the employment status of rural people and they provide almost no helpful information in respect to the extent and degree of their underemployment. Because of the lack of data, therefore, I will not attempt to give an aggregate picture of employment and underemployment even for the Appalachian Area. Rather, I will limit my remarks to reporting on some special studies of the problem which have been made in this and

¹ Charles E. Bishop, "Underemployment of Labor in Southeastern Agriculture," *J. Farm Econ.*, 36:2, May 1954.

other parts of the country. I will draw most heavily on a study² made in a ten-county area of West Virginia and reported by William H. Metzler and Ward F. Porter. In fact, I will use much of their language.

For the benefit of those of you who do not already know, the Southern Appalachian Area is composed of 190 of the mountainous counties in the seven states of Alabama, Georgia, Kentucky, North Carolina, Tennessee, Virginia, and West Virginia. It includes about 27 percent of the land area and 26 percent of the population of these states.

In 1954, we at the West Virginia Agricultural Experiment Station, in cooperation with the Production Economics Research Branch of Agricultural Research Service, United States Department of Agriculture, undertook a study of employment and underemployment of rural people in the Upper Monongahela Valley of West Virginia. This Valley includes ten counties in the North Central part of the State. It is rather typical of West Virginia, its agriculture being somewhat better but its mining and industry being somewhat below the level for the State. I believe, from some study and considerable observation, that this ten-county area is also roughly typical of the Appalachian Area.

Our study included a sample of 875 rural households containing at the time of the survey 2,287 persons 14 years old and over. A sample was desired which would provide an accurate cross section of households, farm and nonfarm, in the open-country area of the Valley. Sampling on a geographic basis presented problems because some areas of the Valley were sparsely settled, whereas others were densely populated in spite of the rugged terrain. Also, in the area, there are a large number of "string towns," settlements of nonfarm people developed along a highway and stretching out from a store or two, a filling station, or the like. These "string towns" and other settlements of 100 people or more were excluded from the sample. The sample was drawn by Earl Houseman of the United States Department of Agriculture. We are confident that the households in it are highly representative of the open-country households of the Valley.

Although one-third of the households interviewed were located on Census farms, agriculture was a supplemental rather than a primary source of income for most of them. Forty percent of the households in this open-country area were those of workers in coal mines, factories, stores, and other nonfarm places of employment who relied entirely on nonfarm work as a means of support. They were simply rural residents having no connection whatsoever with the agriculture of the Valley. For West Virginia we estimate that at least 35 percent of the people living in the open-

² *Employment and Underemployment of Rural People in the Upper Monongahela Valley, West Virginia*, William H. Metzler and Ward F. Porter, W.Va. Agr. Expt. Sta. Bull. 404, June 1957.

country fall within this category. I can only guess that at least 25 percent of the people living in the open country of the Appalachian Area are likewise situated. Fourteen percent of the households in the sampled relied for their support solely on non-work sources of income; i.e., royalties on coal and gas, rents, interest, etc., but mostly Social Security, retirement and public assistance payments. Only five percent of the households in the sample depended on agriculture alone for their support.

The point I want to make with these data is that a very substantial proportion of the people living in the open country of the Appalachian Area have little or no connection with farming even though a majority of them may be counted by the Census as farmers. Many professional agricultural workers also unfortunately mistake them for farmers. They also figure in the Federal "farm relief" programs because their very low incomes from farming, not total income, add in nicely to lower the average income of farmers in the United States, and thus help worsen the picture of the financial plight of the American farmer. Each state has more of this type of "farmer" than is commonly recognized. When their income from farming enters into the average for the country it makes a nice "crying-towel" for farmer advocates, but once appropriation bills are well underway, these people are quickly forgotten.

But to return to the plans of the study. An effort was made to ascertain how many days each person 14 years old and over had worked during the 12 months preceding the interview, the kinds of work he had done, and the number of days at each kind of work.

In regard to hired farm work and nonfarm employment the number of days worked by each member of the household was recorded as given by the respondent. Arriving at the number of days of work on the home farm, however, constituted a more difficult problem since farmers have less identifiable bases on which to make a statement of days worked by each member of the household. Hence a special procedure was developed for estimating days of work on the home farm. People who lived on acreages that qualified as farms under the Census definition were asked to give the number of acres in each crop grown, the numbers of all types of livestock kept during the year, the types of machinery used, their cultural practices and the total amount of product from each of their enterprises. Each farm respondent also was asked what percentage of the total amount of work on the farm had been done by each member of the household. From data available at West Virginia University on the amount of labor required for all farming operations in the State at different levels of technology the total man-hour equivalents were computed for each farm covered in the survey.

To illustrate the method of computing man-hour equivalents: if a farmer reported 1 acre of corn with ground-breaking being done with a two-

horse one-bottom plow; disking and harrowing with implements drawn by two horses; planting with hand planter; fertilizer spread by hand; cultivating with hoe three times; harvesting by cutting by hand, shocking, and husking from shock; he would be charged with 87 hours per acre. Another farmer, however, who prepared his land with a three-bottom plow, and large implements drawn with a tractor; planted with a two-row tractor-drawn planter; cultivated three times with a two-row tractor-drawn cultivator; and harvested with a one-row mechanical picker would be charged with only 13 hours per acre.

Another illustration in handling charges for livestock: if the farmer had a dairy herd of one to four cows he was charged with 170 hours per year per cow, but if he had 15 or more dairy cows in his herd he was charged with only 120 hours per cow.

Total man-hour equivalents thus arrived at were divided between members of the household according to the percentage of each person's time devoted to home-farm work as given by the respondent. Man-hour equivalents were converted to days at the rate of 10 hours per day. This procedure provided the data for "number of days of farm work" done by each member of the farm household during the previous year.

It is difficult to establish a norm for full or adequate employment as contrasted with underemployment. Such a norm would vary with age and physical character of the worker. It would also vary with sex and status in the household. Underemployment, on the other hand, is not entirely a matter of number of days worked. It exists also when there is underutilization of the worker's skills and abilities; e.g., when a skilled engineer or electrician is regularly employed at ditch digging, washing cars, or other unskilled or semiskilled work.

The school teacher, teaching 170 days in the year, probably is adequately employed as the term "full employment" is commonly used. Some operators of small stores and filling stations with few customers appeared to be greatly underemployed even though they reported working as much as 365 days per year. In this study, as shown earlier, farm operators were not given an opportunity to make a similar overstatement of actual number of days worked. Their work time was figured on the basis of actual amount of time normally required to perform the operations of their farms. Hence a more reliable measure of employment of farm workers is provided than of operators of nonfarm businesses. The determination of underemployment is still quite rough and will be spoken of only in general terms.

In a study³ of employment and underemployment of rural people in the Ozark Area, Metzler and Charlton made their estimates of underemploy-

³ *Employment and Underemployment of Rural People in the Ozarks*, William H. Metzler and J. L. Charlton, Ark. Agr. Expt. Sta. Bull. 604, Nov. 1958.

ment in about the same way as we did in West Virginia. Bird, Miller, and Turner, in their study⁴ in the Eastern Ozarks of Missouri defined a man work day on a farm as "the average amount of work that should be accomplished by a worker in a ten-hour day, when working with average efficiency and average equipment on a medium-sized farm as defined by the Extension Service of the University of Missouri." In their study the man work days needed to handle the enterprises were computed for each farm in their sample.

Bishop and Sutherland in their study⁵ in the Piedmont Area of North Carolina state:

In deriving estimates of underemployment in agriculture it is necessary that data be obtained as to (1) the quantity of labor in the farm family labor force, and (2) the use made of this labor. These two quantities must be converted to a comparable basis. In this study the man-work hour was selected as the basis of comparison between labor on farms and work performed on farms. In the estimation of the quantity of labor on farms, the male rural-farm population, 10 years old and over, was converted to man equivalents on the basis of the wages paid to hired farm workers in March and September of 1945. In following this procedure it was assumed that wages received by workers reflected the productivity of the workers. Thus the age group with the highest weighted average wage was assumed to be most productive and was given a rating of one man-equivalent. Other age groups were converted to man-equivalents on the basis of the relationship between the weighted average wage rate for that age group and the weighted average wage for the highest paid age group.

Females in the rural-farm population were converted to man-equivalents on the basis of data from the North Carolina Agricultural Experiment Station in regard to rates of substitution between male and female labor in agricultural operations in the State. The man-equivalent conversion factors for females are based upon the capacity of females to do farm work.

By this method, for example, males in the 35-44 year age group were rated as one man-equivalent while those in the 14-17 year age group were rated at .706 man-equivalent: females in the 35-44 year age group were rated at .7 man-equivalent and those in the 14-17 year age group were rated at .5 man-equivalent.

For purposes of this study a man-equivalent was defined as 2,704 hours of work per year. Estimates of the amount of work performed on small farms in this Southern Piedmont area were obtained by multiplying the numbers of livestock and acreages of crops produced by the number of man-hours of work generally used in the production of crops and livestock and maintenance operations on farms in the area. The estimated amount

⁴ *Resources and Levels of Income of Farm and Rural Non-farm Households*, Ronald Bird, Frank Miller, and Samuel C. Turner, Mo. Agr. Expt. Sta. Res. Bull. 661, March 1958.

⁵ *Resource Use and Incomes of Families on Small Farms, Southern Piedmont Area, North Carolina*, C. E. Bishop and J. G. Sutherland, N.C. Agr. Expt. Sta., Dept. of Agr. Econ., AE Info. Ser. 30, Feb. 1953.

of work performed on the small farms by members of the family labor force was obtained by subtracting the amount of work performed by hired labor from the total estimated amount of work performed on these farms. The difference between the amount of labor in the adjusted family labor force and the amount of labor used on the family farm represents what has been called the "physically underemployed labor."

In this estimation of the quantity of underemployed labor on farms certain deductions from the total quantity of labor on farms were made. Workers who were employed full-time in an off-farm job were not considered as being available for any work on the family farm. Workers who were employed in off-farm occupations involving less than full-time work were considered to be a part of the farm family labor force when not employed in off-farm work. Also, man-hours of family labor which were lost as a result of illness or disability were not included in the labor potential. Children between the ages of 10-17 and others who were enrolled in school were not considered as being available for other than chore work during the school months.

In other studies of this problem of underemployment other methods of estimating its extent have been used. I believe, however, that the descriptions of methodology which I have presented will serve to illustrate the variety of approaches to the matter.

But to return to some of the findings of the Upper Monongahela Valley Study: of the 2,287 persons 14 years old and over on whom records were obtained (we will refer to these as the "labor force"), 1,342, or 59 percent of them, had done some work during the 12 months prior to the interview. We will refer to this latter group as the "workers." This figure of 59 percent compares with the 43 percent of the labor force who reported some type of farm or non-farm work as their majority activity. From this we deduce that 16 percent of the workers were primarily housewives, students, or retired or disabled persons. The percentage of nonworkers in the labor force runs above that for the nation generally, 37 percent, but below the 43 percent reported in Eastern Kentucky⁶ and the 48 percent reported in Southeastern Oklahoma.⁷

Evidence of underemployment among the rural people of the Upper Monongahela Valley of West Virginia includes the following:

1. *Many workers did not work full-time.* Of the 1,342 workers (59 percent of the labor force) who reported having done any work during the 12 months prior to the interview, 39 percent worked less than 100 days, 21 percent worked from 100 to 199 days, and 40 percent worked 200 days or

⁶ *Rural Manpower in Eastern Kentucky*, Robert E. Galloway, Ky. Agr. Expt. Sta. Bull. 627, June 1955.

⁷ *A Study of Rural Manpower in Southeastern Oklahoma*, James O. Turner, Okla. A&M Coll. Tech. Bull. T-156, Sept. 1955.

more. The average for all of these workers was 154 days, 185 days for males and 92 for females.

2. *Agricultural workers were greatly underemployed.* Approximately one-half of the workers did some work on their home farms. This group averaged 61 days of farm work per year. Twenty-nine percent of all workers did no work other than on their home farm and they averaged only 58 days per year. This short period of work is partly explained by the large proportion of women, youths, and older persons in this group, but the males 25-64 years of age in this group worked only 130 days and those 65 years old and over worked only 85 days per year. The agricultural resources of the area are simply not being used in a manner to provide full employment.

3. *Short-term or no employment prevailed among women and youths.* Sixty-four percent of the females in the households interviewed had no remunerative employment during the year. Only 11 percent of them had been employed as many as 100 days, yet 28 percent of them were neither housewives nor in school. Only 35 percent of the sons 14-24 years old had worked as long as 100 days, yet 53 percent of them were not in school. Females 25-64 years of age employed in service work averaged only 93 days of work during the year.

4. *Some underemployment in coal mining.* Males 25-64 years of age employed mainly in coal mining worked for an average of 177 days during the preceding year.

5. *Many persons available for employment.* A final indication of a lack of employment or underemployment is to be found in the fact that 16 percent of the persons 14 years old and older were reported as available for other employment, and among the male heads of households, 20 percent said that they were available for additional or other employment.

In the Ozark Area of Missouri, Metzler and Charlton report that 59 percent of the labor force in the sample households had done some work during the year previous to the survey. They worked an average of 141 days. Those whose major work was farm operation worked an average of 166 days, and those who were principally nonfarm workers worked an average of 231 days.

In the Southern Piedmont Area of North Carolina, Bishop and Sutherland report that 7 of the 24 million man-hours of labor in the labor force on part-time farms and 17 of the 34 million on small commercial farms, or forty percent of the family labor resources on all small farms, was underemployed in 1950. The amount of underemployment on the 12,084 small farms included in the study was equivalent to 8,650 able-bodied men. This quantity of labor is equivalent to two men for every three farms.

Galloway and Beers reported that, in Eastern Kentucky in 1951, 57 per-

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cent of the rural population 14 years old and over did some work during the year. Twenty-five percent of the rural farm workers worked less than 150 days, but only 9 percent of the rural nonagricultural workers worked less than 150 days.

As might be expected, because of the lack of employment and the high degree of underemployment indicated by the data I have presented, the incomes of the households in the Valley were modest to small. The average income of the households in the sample was \$2,675 in 1954. Approximately one-fourth of these households had incomes of less than \$1,000 but another one-fourth had incomes in excess of \$3,000.

The average earnings per worker who engaged in each type of work was as follows:

<i>Type of Work</i>	<i>Earnings in Year</i>	<i>Earnings per Day Worked</i>
Worked on home		
farm only	\$ 132.00	\$ 2.25
Farm wage work	259.00	4.21
Nonfarm work	2,206.00	11.85

Although incomes of these open-country households were modest they came from a wide variety of sources. Eighty percent of the income came from non-farm employment, 14 percent from nonwork sources, but only 6 percent from farm operations and farm wages. This latter seems significant when we are dealing with open-country households viewed by so many people as farm households.

I want to be the first to admit that this is not a very sophisticated handling of the topic assigned to me. The study on which I have reported is only one of several approaches that have been used to learn a little more about the extent of underemployment among our rural people. I feel confident that the problem of underemployment among rural people is widespread even in certain areas of our so-called better agricultural states. I believe that it is a problem for investigation which deserves the best efforts of several agricultural economists. Solutions may be hastened if we get a better understanding of the nature and extent of the problem.

RURAL DEVELOPMENT PROSPECTS IN THE WEST

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THE National Rural Development Program was expanded in 1958 for the third consecutive year. Today, 30 states including several in the West¹ are participating. Numerous states have expanded the program through the use of state and local funds.

The aim of the program is expressed simply as being "to promote more efficient farming and farm marketing, job opportunities off the farm, more education, better family living, and community improvement in areas with large numbers of underemployed rural people . . . a practical step toward making it possible for more people to stay on farms."²

President Eisenhower evaluated Rural Development thus: "The program has resulted in more opportunities. . . . It can help thousands of rural communities *all across the land* meet the challenge of the future."³

Although the Rural Development Program has always been national in scope, there is little doubt about its original orientation being toward the Southeast. *Development of Agriculture's Human Resources* definitely stressed the southeastern problem.⁴ We westerners have frequently felt the program did not pertain to us; we imply that our conditions are "different."

Is the West "different?" The large area west of the hundredth meridian encompasses only one economic area classed as "serious," none as "substantial," and only four in the "moderate" problem classification in 1950.⁵ According to the criteria used in setting up the Rural Development Program, the West has less low income than other areas. However, the measures used in House Document 149 are unrealistic when applied to western conditions. We ship many supplies from the East and the major markets for our products are either in the East or on the West Coast. Transportation costs are high. Net and gross incomes need to be higher to provide levels of living equal to other areas.

The pockets of low income are smaller in the West than in other regions and low-income ranchers are distributed more randomly throughout the farming population. But the West does have low income. Perhaps we can use the techniques developed in Rural Development to alleviate it. How-

¹ To conserve space in this report the term "West" is defined as the area west of the hundredth meridian, excluding Hawaii and Alaska.

² U. S. Dept. of Agr., news release 3507-58-2, Washington, D.C., Dec. 15, 1958.

³ *Ibid.* Author's italics.

⁴ Eighty-fourth Cong., 1st Sess., *Development of Agriculture's Human Resources*, House Doc. No. 149, Washington, D.C., 1955.

⁵ U. S. Dept. Agr., news release, *op. cit.*, p. 7.

ever, the policies and programs public agencies use in endeavoring to solve problems of low income need to operate on *causal* forces if they are to succeed. Are the causes of low income in the West the same as elsewhere?

The Rural Development Program is basically designed to alleviate conditions described in the report leading to the enactment of the special legislation. The main causes or conditions of low income are listed as: (1) dense rural settlement, (2) high birth rates, (3) few outside jobs, (4) topographic obstacles to use of machinery, (5) "overcrowding" of land, and (6) an abundance of hand labor.⁶ The program logically "follows through" and is reasonably well designed to meet the above conditions.

Are the above six causes the culprits in the West? I must answer that they are so general they must be relevant; but they hardly fit the West. Close examination of the situation leads me to think in other terms.

Key conditions of low income in the West are: (1) high levels of risk and uncertainty, (2) settlement policies on irrigation projects creating farms smaller than the acreage required for profitable operation under current economic conditions, (3) the Indian problem, and (4) the instability of the timber and mining industries resulting in lengthy layoffs which cut off the primary source of income of many rural residents.

Those who are familiar with the West can be expected to call my attention to the valleys in the Intermountain area which are over-populated and in which the land resources are low relative to human resources, and ask where they fit. Western Montana, parts of Colorado, Oregon, Washington, New Mexico, and Utah fit this description. I have not set up a separate classification for them because I hold to the hypothesis that, with the exception of Utah,⁷ they are "refugee areas" from the Great Plains. They are a *result* of risk and uncertainty.

Preliminary results from research at Montana State College show that in the three western Montana counties which constitute the low income area of the state, 16.1 percent of the rural residents lived in the Great Plains *immediately* prior to living at their current residence.⁸ Obviously only a small share of those of Plains origin show up in "last residence" data. We do not know how many had lived in the Great Plains prior to their last change in residence.

The "refugee areas" are the western areas most similar to the Southeast, but even they are quite different. Table 1 compares data from the Montana study referred to above and a West Virginia study. Although the "refugee areas" are different from the Southeast and East, at least one similarity

⁶ *Ibid.*

⁷ Time prevents the consideration of Utah in detail. A religious situation operates as a brake on migration. Rural Development probably has a very high potential.

⁸ O. W. Holmes, Delbert Myrick, J. L. Fischer, joint project of Mont. Agr. Expt. Sta. and Farm Econ. Res. Div., Agr. Res. Serv., U. S. Dept. Agr., unpub.

TABLE 1. CHARACTERISTICS OF RURAL RESIDENTS, SELECTED WEST VIRGINIA AND MONTANA LOW-INCOME AREAS

Characteristic	Montana ^a	West Virginia ^b
	Percent	Percent
Education (male heads)		
Less than 8 years	17	36
8-11 years	45	52
12 years and over	38	12
Respondents classified by income sources		
Full-time farmer	35	5
Part-time farmer	23	13
Non-farmer	28	41
Retired	14	—
Unclassified	—	41
Characteristics of the labor force		
Size of labor force, number	(929)	(2,287)
Workers 12 years and over wanting work	9	16 ^c
Workers available and preferring farm work	24	10
Workers available and willing to leave home	15	64
Heads of households available and willing to move	63	75
Characteristics of farms		
Type of farm		
Dairy	31	10
Beef	32	—
Grain	13	—
Livestock	—	13
Other	24	77
	Dollars	Dollars
Income		
Average gross farm income	(5,870) ^d	(1,529) ^e
Average income, all sources	(5,540) ^e	(2,675) ^f

^a O. W. Holmes, Delbert Myrick, J. L. Fischer. Unpublished preliminary data from survey of sample of rural residences conducted jointly by Mont. Agr. Expt. Sta. and FERD, ARS.

^b *Availability for Employment of Rural People in the Upper Monongahela Valley, West Virginia*, W. Va. Agr. Expt. Sta. Bull. 391, June 1956; *Employment and Underemployment of Rural People in the Upper Monongahela Valley, West Virginia*, Bull. 404, June 1956.

^c Workers 14 years and over.

^d Average for all full-time and part-time farms in the survey.

^e Average for all rural residents.

^f Total number of farms as defined by the 1950 Census and total cash farm income in 1950.

exists. People have moved into these areas and refused to adjust amid *stability* in agriculture. The mountain valleys seldom experience crop failures; farmers are able to subsist if they are willing to accept low levels of living. The wrath of drought, hail, and swings in cattle and sheep prices do not "force" commercial farming on them. This is not true of the Great Plains.

Rural Development has several possibilities in these areas. They usually have water, and they lie on the perimeter of the high risk areas where wholesaling, servicing, and recreation are expanding. Population tends to be concentrated and timber is frequently available. In general, the poten-

tial is high if managerial ability and capital in both agriculture and other pursuits can be mustered. Probably the highest potential lies in processing of farm and ranch products. Since these areas are on the perimeter of the plains or other high risk areas, they can draw their supply of product from large areas and not be seriously affected by the characteristic sporadic production. The development of the West Coast provides new and growing markets.

High Risk and Uncertainty

Truly risk and uncertainty are the bywords of the Great Plains and the ranching areas. The wrath of drought, hail, flood, fluctuations in the prices of cattle and sheep, and the resultant hardship with mass migration from large areas are almost annual magazine features in the United States. Thousands of pages have been written on the subject.⁹

Figure 1 shows wheat yields over a 20-year period for a single tract of cropland in Judith Basin county, Montana. The mean yield is 14.5 bushels per seeded acre, the standard deviation is 6.4 bushels, and the coefficient of variation 44.4 percent. A yield of approximately 11 bushels is required

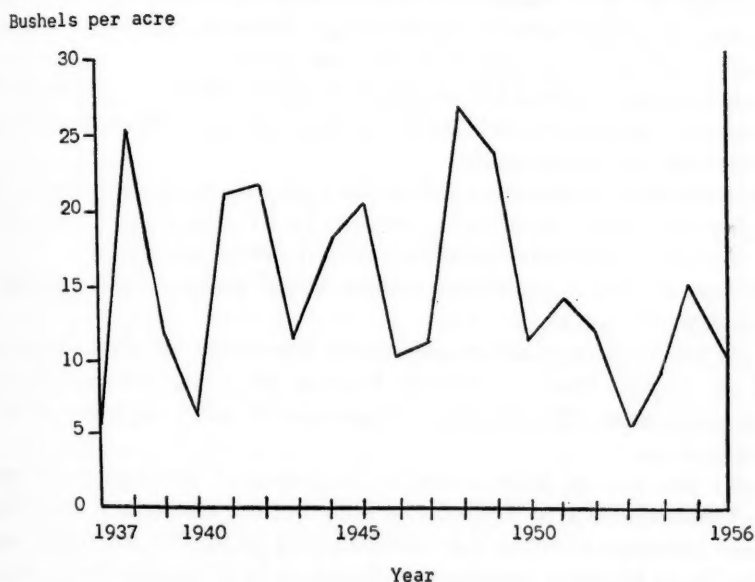


FIGURE 1. TWENTY YEAR YIELD ON ONE TRACT OF CROPLAND, JUDITH BASIN COUNTY, MONTANA

⁹ The sociologist, Carl Kraenzel, has a notable work, *The Great Plains in Transition*, U. of Okla. Press, Norman, Okla., 1955.

to cover farm expenses (excluding depreciation) and minimum fixed family living costs on a 1,640-acre summer fallow farm in the area.¹⁰ Yield series showing much greater variation could be cited. The temporal coefficients of variation from 30 individual tracts in Sheridan and Roosevelt counties range from a low of 36 percent to a high of 66 percent!

On the average, typical farmers in high risk areas are not in a low-income position; however, *the average is very misleading*. All families in these areas periodically go through periods of hardship. Whenever low yields or prices occur early in the life of a farmer or rancher, he has great difficulty surviving. Although gambling is illegal in most of the West, "Lady Luck" is still a valuable friend. Hjort applied a reserve strategy to temporal yield series in two typical areas. Using a simplified budget technique and existing yields for the past 20 years, one hypothetical farmer had *no chance of survival*. But had the actual yield series been inverted, he would have accumulated more than \$180,000!

The variation among farmers' incomes within an area in any given year is great. Hjort observed 63 tracts in two counties. The mean wheat yield was 15.2 bushels, the standard deviation among tracts was 8.3 bushels, and the coefficient of variation was 54.5 percent. The variation within any township is estimated to be equally large. Showers and hail cause very irregular yield patterns over both time and space.

I see little in the Rural Development Program which can aid in providing needed security and stability to our high risk agriculture. Several conditions must be remembered:

(1) Industrial development within the high risk areas must always face a highly fluctuating, competitive situation for its labor supply. When farm and ranch conditions are "good" we are *not* overpopulated.

(2) Low density of population creates several problems when industrial development is a goal.

(a) Markets for products are distant. Something less than 10 percent of the United States population lives in the Great Plains and Intermountain areas. The market is thousands of miles from the place of production.

(b) The pool of labor available for industrial development is small and limited. Refer to Table 1 and note that the labor force available in three Montana counties was one half that in the West Virginia area. The three Montana counties are almost as large as the whole state of West Virginia and are in our more thickly populated area.

(3) With the exception of the main East-West railroads and the main highways, the Plains and the Intermountain areas have poor freight trans-

¹⁰ Howard Hjort, *The Use and Effectiveness of Financial and Physical Reserves in Montana's Dryland Wheat Area*, unpub. thesis, Mont. State College, Bozeman, 1959.

portation facilities. The small rural towns tend to be isolated.

(4) The whole Great Plains faces a water shortage which carries many limitations on industrial and other development.

(5) The Great Plains is fast becoming an area that is serviced from the outside. In the past many larger towns were wholesale centers for the surrounding area. The wholesaling function is moving to the foothills of the Rocky Mountains or eastward to the more densely populated humid area. Rapid growth is occurring at Billings, Great Falls, Denver, Albuquerque, Oklahoma City, Fort Worth, Omaha, and other cities that are on the perimeter of the Plains, not *in* it.

(6) Industrial or other development in the Intermountain or Plains area is likely to be accompanied by much greater income "leakage" to outside areas than in the Southeast. In highly populated areas a small increase in income creates a substantial multiplier effect on other local business. Higher incomes among the scattered population of the Plains and inland West are not likely to create enough additional buying power to increase the local manufacture of very many products.

I conclude that there is little opportunity for Rural Development in its present form to be of much help to the Great Plains or other high risk areas. However, I readily admit there are likely to be exceptions to my generalization. Highly motivated human effort can and will overcome the handicaps in some communities. The methods used in Rural Development should be of value to all communities. I limit my conclusions to the expectation that money spent on Rural Development programs is likely to return low dividends *in total*; however, the dividends may still be above the cost.

Irrigation Projects with Small Farms

The size and scope of the low-income problem created by unwise settlement policies on irrigation projects is unknown. Accurate statistics are unavailable. I estimate that half of the irrigation projects in the West have a substantial "small farm" problem.

The Newland's project in Nevada is a good example. It involves an area of approximately 70,000 acres; however, seldom is more than 50,000 acres irrigated. There are more than 900 farm units, or an average irrigated acreage of about 70 acres. Because of the relative severeness of the climate, the distance from markets, and the isolation of the project, the land has primarily been used in the production of roughage. Even though alfalfa yields are high, the small farm size prohibits profitable operation. Were it not for a nearby Navy air base, the situation could easily be a local crisis. It is a high cost of living area and considerable net cash income is needed.

I think Rural Development has *some* opportunity in these areas; however, the problems are many and perplexing. A few large developments

have a good potential, but most of the areas where the problem is serious are isolated, the pools of labor are small, and they are distant from markets. They usually have water and the population is concentrated. The potential of Rural Development is slightly better than for the Plains, but again the problems appear overwhelming.

The Great Indian Problem

Much of the following is adapted from a paper by Dr. Walt Fuhrman presented to the 1959 meeting of the Western Farm Economics Association.¹¹ There is much food for thought in his paper; I urge all to read it.

Easterners frequently hear about oil, uranium, or other minerals being discovered on tribal lands and its resultant wealth. This is misleading and generally untrue. Few social groups in the United States face more serious problems of low income than our native Americans. The plight of the typical reservation Indian is very serious, its cause is unique, and the solution more difficult than for any other single social or economic group. The Indian's traditions and environment are quite different from rural western whites. The reservation Indian does not "think like" his rural white neighbor.

The horse, the rifle, and simple steel hand tools introduced early in the eighteenth century were innovations which were compatible to the existing Indian economy. They were readily adopted. The increased effectiveness in the production of food, clothing, housing, and in transportation resulted in a "golden Indian age." The Plains Indians were economically abreast of their white counterpart. But, by the time of the Battle of the Little Big Horn in 1876 the end of the "golden" era was near. The Sioux and Cheyenne beat Custer, but the fight to retain their way of life was lost. This time the changes were *not* welcome and were not easily integrated into the Indian value system.

The male's position was changed drastically in the shift from the hunting to the reservation economy. Food rations replaced the hunt, hunting grounds needed no protection from hostile neighbors, raids on the neighboring tribes were prohibited, and horse stealing was a crime instead of a sport. Men became idlers because there was little reason to do otherwise. The notion that that Federal Government was obligated to provide for them gained considerable acceptance. The incentive to productive effort in the economic field was largely destroyed.

Our western Indians have a tradition of sharing. It is a wonderful ethical concept but is an "economic curse." Sharing one's fortune was natural

¹¹ Walt Fuhrman, "Economic Opportunities for Indians," *Proc. Western Farm Econ. Asso.*, Logan, Utah, July 1959.

and vital in the old days when the larger family group and adopted relatives functioned as an economic unit. The less able were helped by the more able, there were no orphans, no hunger, no cold, and no destitute unless *all* were hungry, cold, and destitute. Sharing is still common among reservation Indians and refusal to do it may bring social censure. Sharing seriously hinders the ability of the individual to accumulate capital and invest.

Saving was unknown in the old days. Food was replenished constantly through hunting, and sharing reduced the need to store. Most economic goods were not very important. Excessive clothing, blankets, etc., were burdensome when moving camp. The need for saving, storing, accumulation of capital and investing to provide for future income and the security of the family is just not a part of Indian culture.¹²

Family income data is available for four reservations in the Missouri River Basin. The years are not uniform, however, the range is from \$1,136 on the Northern Cheyenne Reservation to \$3,846 on the Shoshoni Reservations. On all reservations the income from wage work and welfare assistance is substantial.

In most areas the land owned by Indians or held in trust for them has greatly diminished during the past century. Frequently only a third or less is used by Indian operators. Serious difficulties are usually involved in getting trust land integrated into reasonable ranch or farm units.

Throughout the West the typical agricultural pursuit is range livestock. Recent studies made for the Missouri River Investigation Agency show some opportunities for improvement,¹³ but the full development of livestock enterprises will *not* solve the low-income problem. Opportunities for irrigated crop farming do not appear to be too good either. As for wage work near the reservation, Indians are already doing much of it. On the four reservations cited earlier, income from wages was approximately double the income from agriculture. The seasonality of work presents a serious problem and workers typically return for the winter months and require welfare assistance. Indian people must either develop industrial opportunity on the reservations or move.

Dr. Fuhrman states that the number of jobs is sadly deficit relative to the number physically capable of full-time employment. "Studies . . . show that less than half of the time of employable Indians . . . was utilized in economically productive pursuits. Only one-fourth to one-third were fully employed. From one-eighth to one-fourth reported no economically productive work of any kind during the year. The condition has been grow-

¹² *Ibid.*

¹³ S. J. Tietema, *Indians in Agriculture, II, Cattle Ranching on the Blackfeet Reservation*, Mont. Agr. Expt. Sta. Bull. 532, June 1957.

ing worse because of increased (reservation) resident population and decreased opportunities for local farm employment."¹⁴

More jobs in the vicinity of the reservations are obviously desirable; however, the location of most reservations limits this prospect. Light industry establishment on the reservation is being encouraged by the Bureau of Indian Affairs; but such developments are not likely to meet the growing need. The reservation population has been increasing.

Jobs away from the reservation offer the most promising opportunity for Indians to become self supporting. Training programs leading in this direction are in progress but they need to be expanded. Indians are capable of supplying an increasing share of the rural-to-urban migrating work force; the problem lies in social adjustments.

The problem of integrating Indians into the economy of the western community is quite different from the racially oriented problem in the Southeast. The Negro population was brought to this country to pursue economic activities which were integrated with the activities of the white population. In the West the reservations tend to be isolated social and economic pockets.

Studies reveal there are about 12,000 employables among the reservation population in the Missouri River Basin. Proper development of the range resources could utilize about one-fourth, and another one-third might find fairly satisfactory employment on or near the reservations. This leaves 4,000 to 6,000 of the present families and an additional 300 to 400 new families each year which need to migrate. Locating jobs, housing, and moving this number is a sizeable job in itself, but providing real economic opportunity involves much more. "The Indian must be brought to the job not only physically but psychologically and incentivewise if transplantings to industrial and commercial urban areas are to take root and flourish. . . . In trying to establish effective incentives . . . it is well to recognize that the economic goals and motivating forces underlying Indian culture are not the same as those of the dominant culture. . . . In many respects the situation facing reservation Indians . . . is the same as that for non-Indian people in rural areas where resources are inadequate to support the present and prospective future populations, *but correction or improvement of the reservation situation is by far the more difficult and urgent. The greater difficulty stems from human rather than physical resource factors—factors associated with value systems and goals and deep-lying motivation forces.*"¹⁵

Can the Rural Development approach solve the kind of social and psy-

¹⁴ *Op. cit.* Author's parenthesis.

¹⁵ *Ibid.* Author's italics.

chological problems reservation Indians face? I doubt it; however, with certain adjustments I would like to see it tried. The seriousness of the problem warrants taking the risk.

Areas Dependent upon Mining and Timber Industries

Many rural people in the West are predominantly mining or timber workers who live on small farms. They have settled on these tracts to provide security from fluctuating employment in the industries responsible for their main source of income. Typical of these areas is Lincoln county, Nevada, where the predominant source of income is from the mines, and the timbered areas of Oregon and Washington.

Areas such as those in Washington and Oregon which are near larger centers of population have a good chance to utilize the fairly large numbers of workers which are available. They can produce products which can be marketed in the larger population centers. Rural Development in its current form should be useful.

The distant, isolated areas such as Lincoln county, Nevada, pose a different problem. All that was said earlier about isolation, distance from markets, lack of a sufficiently large pool of labor, etc., applies. Something more than Rural Development is needed. A positive action program with dollars and cents "teeth" is badly needed.

Summary and Conclusion

- (1) The West is different.
- (2) Although Rural Development probably has some potential, the really serious problems in the high risk and uncertain areas are above and beyond the scope of the program. Serious attention needs to be given to the problems of high risk and uncertainty *per se*, viewing *areas* and *industries* in perspective.
- (3) Much greater attention needs to be given to the very serious Indian situation. The idea that Uncle Sam can be out of the Indian business in a few years is misleading and a social disservice to the nation. The problem of social and psychological adjustment is severe and needs special attention. Rural Development type programs have some potential but they must be more adequately geared to the special situation.
- (4) Irrigated valleys with too many small farms may be able to help themselves through the Rural Development approach; however, they have many obstacles to overcome. Distance from markets, isolation, and small labor pools limit the potential.
- (5) Stability in the timber and mining industries is badly needed and would aid in the satisfactory social and economic adjustments of many areas. A few substantial "pools" of labor are to be found in areas dis-

tressed by this cause and, where so, Rural Development could help. Those close to markets have greater opportunity.

(6) The West is a big country. If Rural Development is to be a useful tool, the opportunity to more readily adapt it to a variety of special situations is needed.

DISCUSSION: INTERSECTOR RELATIONS IN RURAL DEVELOPMENT

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Low income and underemployment are widespread in agriculture. The problem has been accentuated by the rapid changes in agriculture and is more acute in some areas than others. Yet, pockets of underemployment and associated low incomes exist in all sections of the Nation. Much emphasis has been given to the nature and extent of low incomes in agriculture. Prior to the Rural Development Program, however, little study was given to delineation of specific low-income problems nor to testing possible solutions and effectiveness of action programs.

Each paper presented in this section is directed toward a different aspect of rural development as it is related to low-income problems. Since this discussion is for all three papers and since I am in substantial agreement with each, my comments are of a general nature. They are directed first to a brief summary of each paper and then to some additional observations related to those presented in the three papers.

Hendrix considers the problems of (1) explaining chronic underemployment and low incomes as general economic phenomena and (2) determining why agriculture, particularly in low-income areas, is more subject to underemployment than are other sectors of the economy. He assumes that underemployment is widespread in agriculture and believes that the solution lies mainly in a transfer of labor to more remunerative nonfarm employment. Main causes of low income are attributed to impediments to this transfer of labor. The importance of knowledge and capital limitations as impediments to labor transfers are considered of secondary importance by Hendrix and he attributes the main cause to imperfections of the labor market. In his well stated explanation of chronic underemployment and low incomes as general economic phenomena, he gives strong support to the fact that chronic underemployment cannot exist in a perfectly competitive economy.

A logical discussion of why underemployment does exist under conditions which deviate from perfect competition is provided in the second

part of Hendrix's paper. He describes conditions in agriculture that partially explain why this sector of the economy is subject to a greater than proportionate share of the Nation's underemployment. Hendrix does not see any quick end to the low-income problem nor does he offer positive and specific solutions. He does believe that the solution will be mainly through the integration of the income policies of agriculture with the Nation's general economic policy. The general types of possible measures he offers include (1) a program of *laissez-faire* to break down labor market imperfections, (2) measures to achieve and maintain full employment despite imperfections in the labor market, and (3) a program of comprehensive supply controls in commercial agriculture coupled with income transfers to the Nation's underemployed farm people where necessary.

Armentrout has presented an interesting paper on the extent of underemployment in an area typical of much of the Southeast. He discusses several procedures used in determining the nature and extent of underemployment. This methodology is important for those studying adjustment opportunities for low-income families. His discussion emphasizes the difficulties encountered in the measurement of amounts of labor available and used by farm families. In fact, he notes that many difficulties are encountered when one attempts to define and measure underemployment even in a physical sense. I certainly concur with Armentrout that additional work, both of a methodological and an empirical nature, is needed in this area. His findings about the nature and extent of underemployment in West Virginia are typical of those of many sections of the Southeast. Those engaged in adjustment studies certainly need improved ways to evaluate the labor resource. It has been my experience in programming analysis in Georgia that errors in evaluating labor probably affect the results as much as any other item. I believe that we frequently overestimate labor available and underestimate the labor coefficients. This results in solutions that are most difficult for the family to follow and, consequently, these solutions may seriously overestimate income potentials. Armentrout's paper and the references he includes are worthy of further consideration by those working in this area.

Fisher's paper emphasizes a point frequently overlooked in the Rural Development Program. He shows quite clearly that the Rural Development Program must, of necessity, be adjusted to conditions peculiar to each given area. This is important not only between areas as different as the West and the Southeast but also within subregions of an area such as the Southeast. Fischer stresses that the West is different from the Southeast primarily because of different factors causing low incomes. He includes as causal factors for the West (1) high levels of risk and uncertainty, (2) settlement patterns on irrigation projects, (3) the Indian prob-

lem, and (4) the instability of the timber and mining industries. Due to the differences in causal factors, Fischer concludes that, except in very special cases that represent only a small part of the total problem of the West, the Rural Development Program has little to offer to solutions of low incomes in this area.

One wonders if perhaps we have confused a particular action program—the Rural Development Program as it is now being conducted—with the broader problem of developing rural areas, regardless of their location, peculiarities, or the particular type of action program used to attain results. Fischer probably accepts the general philosophy of the Rural Development Program. He only emphasizes that the form it takes would have to be materially different for the West than the Southeast. However, even though the West is different, a closer look may reveal some surprising similarities. Certainly there are some similarities between the Indian problem of the West and the racial problems of the South. Also, would not one expect to find that some similarities exist between the instability of the timber and mining industries of the West and the textile industries of the South?

The three speakers have presented, in a commendable manner, different aspects of the problem of underemployment and associated low income. They have emphasized problem delineation far more than problem solution. Relatively more emphasis needs to be given to the solution of these problems than to their definition, delineation and measurement. In closing, I would like to add a few observations related to those presented here: (1) Since most solutions to low-income problems of rural people indicate a transfer of people from the farm to the nonfarm sectors, many are reluctant to accept this cure because it discounts the importance of agriculture. I feel that this is not necessarily true and that there is a need to study other ways of measuring the importance of agriculture than in terms of the number of people employed. (2) Although the main impediments to labor transfers may be imperfections in the labor market, one should not discount too much the importance of personal characteristics such as age, education, and health, which will not be changed by removal of labor market imperfections. (3) We should continue to seek economic growth and development for the Nation as a whole. However, little of this development may reach low-income areas unless we have at the same time active programs for regional development. (4) Finally, the Rural Development Program should now have passed the testing stage. The results need careful appraisal and the limitations imposed by restricting this program to the county level need to be removed.

DISCUSSION: INTERSECTOR RELATIONS IN
RURAL DEVELOPMENTRALPH J. RAMSEY
University of Kentucky

The topic and the papers present a challenge to our thinking. The educational and action agencies in Rural Development are looking for new directions and new activities for reaching objectives. I sometimes get a feeling of vagueness when reading about Rural Development. Is the target farm people, rural people or low-income people? The issue is not clear in Washington, in the research field or at the county action level. Sometimes the writing and thinking is in terms of one group, sometimes in terms of other groups.

Rural Development was an outgrowth of a study of problems peculiar to farmers with low income which was requested by the President. The concern for low-income farmers was part of the more general concern for people with low income and with substandard levels of living as stated by the Joint Committee on Economics of the Nation. This latter committee was related to the objectives set forth in the Employment Act of 1946. The nucleus of Rural Development and the assigned leadership has been in the U. S. Department of Agriculture, with a focus on farm people. However, in the papers and in the field of activity there has been some concern for the total economy of the Nation and for the total population within the designated areas. The focus is on a segment but the treatment is in terms of the whole.

A second point has to do with possible solutions to the problem. Those of us in agriculture have a vested interest in the field and look for a solution in terms of agriculture. Large areas in the Southeast and in the Plains states have estimated farm replacement ratios of over 150 for the 1950 decade. Migration data indicate that for these areas over half the youth are leaving. For example, of the 120 counties in Kentucky, 51 counties reached a maximum population between 1880 and 1920 and have since declined. These are the counties depending primarily on agriculture. An additional 36 counties reached a maximum population in 1940 or 1950 and have since declined. This latter group depend primarily on agriculture or coal mining. The declines have been in spite of extremely high birth rates. The adjustment of people to employment opportunities has been fairly rapid in these areas. In the Western and Southern states, adjustment by migration has been more dramatic because of droughts, boll weevils, the tractor and other serious influences that have come into the states.

A third general idea is that of relativity. Incomes are low in respect to

national averages and standards. What is low in respect to the national levels may be high in respect to 10 years ago or in respect to a neighboring county. Then too there is the matter of values. Those people in the transition of adjustment are caught between a preference for tradition and a desire for continuous growth. The values of the American Indian are probably no more different from our predominant urban values than are those of the Anglo-Saxon in the Ozark-Appalachian area or the small cotton farmer in the South. These folks have people like themselves for comparison and place a high value on "freedom," leisure, tradition and security in friends and neighbors. Underemployed? Few people are underemployed by a self analysis and in comparison with others in a similar position. Everyone thinks himself to be in a rat race. Some external criteria or the standard of another, or larger, society may indicate a different conclusion. Where we might well agree that low-income farmers are underemployed they might in turn be of the opinion that college professors are underemployed and could be of greater service and get more income in other occupations. Although I feel that we are right, how many of our "scientific values" should be imposed on others? I raise these questions to indicate the motive or lack of motive for low-income people to raise themselves to middle-income position.

The list of factors associated with low income may call for a comment. Density of population is of course relative to resources. Dense populations on the upper Mississippi Delta land get more income than do less dense populations in the hills. A family may be more crowded on a section of land than on 20 acres of irrigated land. High birth rates have been associated with low density of population, agriculture and mining among other factors. Recent family income data indicate that household size increases as family income increases. This may be related to several members of the family working for wages. A high ratio of dependents to workers is a more realistic factor. Low income is concentrated among farm families (on small farms), young people with a first and usually irregular job, retired and older people.

May I suggest a social science concept that is readily recognizable in detective stories. Three elements are required to explain a given behavior—the capacity (native or learned) of the person, the opportunity and the motive. As applied to Rural Development areas, there are limited employment opportunities for high incomes per year and for a second worker per family (women). Industries are attracted to such areas because of low wage rates, nonunion labor, and tax reductions. They make the move in spite of getting less community services than are available elsewhere. Opportunities for increasing the capacity of youth are less in these areas than

for areas of higher income. Motivation to improve the position is weaker for those living in the area than we impute from our value position.

All three elements are subject to change. And it will likely require effort on all three to accomplish the desired result.

Several strategies are being tried at present to solve the problem:

1. Education of youth to fit them for employment in other communities.
2. Re-training of adults to new jobs. (Who will employ a new worker over 45 years of age?)
3. Land retirement from agriculture.
4. Increase of capital on farms and farm consolidation. (Some farmers must get out at the same time.)
5. Moving industry to the labor supply.
6. Moving labor to areas of industrial employment.
7. Supplementary part-time employment for those getting retirement pay.
8. Loosening of those governmental regulations which have tended to freeze areas of production.
9. General education of the public to an awareness of scientific and national standards of performance, and the possibilities for achievement through collective bargaining, group effort, and large-scale planning.

IMPACT OF URBAN-INDUSTRIAL DEVELOPMENT ON AGRICULTURE

Chairman: George H. Aull, Clemson Agricultural College

REGIONAL DIFFERENCES IN THE IMPACT OF URBAN- INDUSTRIAL DEVELOPMENT ON FARM AND NONFARM INCOME

DANIEL G. SISLER*
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I

AN INCREASE in national income is a condition necessary to economic progress; however, the sufficient condition must exist that this enlarged aggregate income will be so distributed that in real terms all segments of the population will be favored by the change in economic activity.¹

The national income has increased approximately three per cent annually during the past 130 years, but what of the sufficient condition? Given the implications of traditional theory, factor adjustments would equilibrate income differentials and no disparities in per capita income or earnings on invested capital would exist. However, the persistence of impoverished areas in American agriculture may be observed. Even the urban sector has not been free from unequal income distribution. In 1950 the median nonfarm income of Lumpkin County, Georgia was \$662, while the comparable figure for Union County, New Jersey was nearly \$4,000.

Traditional theory does recognize that imperfect knowledge and resource immobility may bring about adjustment lags. Does this mean that the problem of income disparities associated with economic development is merely one of adjustment lags? The findings of a group of investigators at Vanderbilt University indicate that in three southeastern areas per capita agricultural income level differences have not only persisted, but have shown a tendency toward increasing disparity.²

* The research for this paper was partially conducted under Purdue Experiment Station Project 893. The author is particularly indebted to Vernon W. Ruttan and Charles E. French, both of Purdue University, for their suggestions during the writing of this paper. (Purdue Journal Paper No. 1491.)

¹ Schultz, T. W., *The Economic Organization of Agriculture*, p. 8.

² Nicholls, William H., "The Effects of Industrial Development on the Tennessee Agriculture, 1900-1950," *J. Farm Econ.*, 38:5, Dec. 1956; Tang, Anthony M., "Farm Income Differentials in the Southern Piedmont, 1860-1940," *Southern Econ. J.*, 23:1, July 1956; Bachmura, Frank T., "Migration and Factor Adjustment in the Lower Mississippi Valley Agriculture, 1940-1950," *J. Farm Econ.*, 38:4, Nov. 1956.

The question then arises—why in a country with well-developed channels of trade and transportation do income differences not only persist but show increasing disparity? It appears that the diverging trends in per capita income are not a result of a degeneration of the income producing ability of one group of counties, but rather they are an outgrowth of varying rates of increase in the income producing abilities among counties.

Several hypothetical models have been employed to identify causal factors in the unequal growth of the income producing abilities of communities:

1. The differential impact of the technological advancement on production functions,
2. Impediments to factor adjustments, especially imperfect knowledge and barriers to resource mobility,
3. Secular drifts in commodity prices placing some communities at a disadvantage,
4. Communities unequally endowed with natural or human resources,
5. Income differentials that are the result of differing rates of development of the urban-industrial sector.

The Vanderbilt group placed particular emphasis on the last three of these models and Schultz touched on all five.

The differential impact of technological advancement may affect communities in different ways. Within agriculture many examples may be cited regarding the ways in which communities producing the same crop have been affected in various ways by changes in technology through the production function. Changes in the yield of cotton have come about by better fertilization, improved plant breeding, and insect control, while the innovation of the mechanical cotton picker has altered the cost structure. It seems evident that the Old Cotton South has not benefited from these innovations to the same degree as have the irrigated cotton sections of the West.³

Income disparities, whether they arise from technological advancement or other sources, may be accentuated by impediments to factor adjustments. The most important barrier to adjustments in the kinds, qualities, and proportions of inputs is inadequate knowledge. Most technological advancements in agriculture favor farmers situated on the most responsive land and disadvantage those who are situated on land with short growing seasons, inadequate rainfall, or low water handling capacity. Farmers are frequently unaware of their technological displacement.

³ In the Southeastern Cotton Belt from 1949-1954, the index of labor productivity rose from 92 to 114 while in the same period the cotton producing sections of the West climbed from 107 to 154. *The Changes in Farm Production Efficiency*, Annual Summary 1955, Supplement 3, ARS 43-15, June 1955, pp. 8-9, Table 3.

The necessary adjustments would be a decline in land values, with an exodus from farming, with those operators remaining in farming making their operations more extensive. Inadequate knowledge and a skewed distribution in command over capital frequently prevents these adjustments. Land values remain at high levels as farmers fail to judge the importance of reduced income-producing capacity of the farming unit. This retention of land in small, over-priced farms leads to declining incomes that make the accumulation of capital necessary to take advantage of the next round of technological advancements increasingly difficult. These factors seem to belie the assumption of traditional theory that the role of land is a passive force in the income-producing process.

Racial barriers, lack of training for alternative employment opportunities, and reluctance to migrate all serve to impede factor transfers and create geographic pockets of poverty.

The third hypothesis rationalizes increasing variance in per capita income on the premise that secular drifts in commodity prices may bring about disparate income levels between communities which are otherwise equally endowed. Empirical evidence in both industry and agriculture does not seem to bear out this hypothesis. In industry vigorous firms exist whose product prices have remained nearly constant for several decades.⁴ This would indicate that the product prices of these firms have declined relative to the general price level. These same firms have prospered in that they have attracted additional capital and resources into their productive effort. In agriculture, price drifts have certainly been uneven, with the prices of some agricultural products surging far ahead of other commodity prices. Still, prosperous farmers are producing the relatively lower-priced products. Adjustments in output and lower product prices have been accomplished in agriculture and industry without bringing about wide discrepancies in per capita income levels. In theory a decline in product prices may be compatible with economic development and may even spur the adoption of new technology and more efficient use of resources, both natural and human.

Original differences in human capabilities and availability of capital and natural resources between communities are capable of giving rise to disparate income levels. Even if both the factor and product markets were operating in an atmosphere of near-pure competition, these original differences might exist for some time. The extent of imperfections in the resource markets and the lack of mobility of the factors of production

⁴ During the 1940-50 decade, the nation's output of electrical energy more than doubled, rising from 11 to more than 27 billion kilowatt hours. With the average 1947-49 price as 100, the wholesale price of electricity dropped from 113 to 93 during the same decade. *Business Statistics, 1957*, Office of Business Economics, U. S. Dept. Com., pp. 29 and 129.

determine the time lag over which these original differences may influence the community.

The time studies of Tang and Nicholls demonstrate that although original differences exerted a positive and recognizable effect on per capita county income in 1850, these differences had all but disappeared by 1900. They concluded that resource transfer and mobility, inefficient as these appeared to be in this period, were sufficient to offset the disequilibrating income effect of original differences. However, in general those counties which enjoyed the greatest original differences again forged ahead in the level of per capita farm income after the period of convergence. This would appear to indicate that some residue of the influence of original differences persisted to kindle the urban-industrial growth which created the ever widening county income differentials over the next decades.

It was also concluded that differential rates of county industrial development explained the increasing disparity in county per capita income levels after 1900.⁵

Through availability of capital for education, lower fertility rates, and other cultural characteristics, original differences enabled those more-favored counties to lower the barriers for future industrial expansion.

This brief exploration of the hypothetical models explaining persistent and diverging income differentials indicates that no single factor explains these differentials, but rather there is a complex pattern of forces interacting, all of which have a role in any particular locale.

This paper will analyze the impact of urban-industrial development on the level of income attained by farm and nonfarm segments of the local economy. The magnitude of the local urban-industrial complex will be employed as a single predictor of income levels since it appears to embrace and accentuate the above factors.

Original resources may provide the prerequisite stimuli to a particular community beyond the critical minimum necessary to initiate industrial development. With the advent of industrial development, the stage is set for growth-accelerating activities. These interacting activities include a lessening of barriers to factor mobility, increased specialization, improved skills associated with better education, and the adoption of innovations resulting from increased capital accumulation. In short, the snowball has started to roll.

The close relationship between economic development and the growth of the urban-industrial sector of the economy has been stated by Schultz in a series of three hypotheses.⁶

1. Economic development occurs in a specific locational matrix; there may be one or more such matrices in a particular economy.

⁵See footnote 2.

⁶Schultz, *op. cit.*, p. 147.



FIGURE 1. ECONOMIC REGIONS OF THE UNITED STATES

2. The locational matrices are primarily urban-industrial in composition.

3. The existing economic organization works best at or near the center of the particular matrix of economic development and it also works best in those parts of agriculture which are situated favorably in relationship to such a center.

The applicability of these hypotheses will be tested in each of the 13 regions into which the nation has been divided by Bogue and Beal.¹ (Figure 1 shows a map of the United States on which has been superimposed the outline of the regional boundaries.)

II

The percent of a county's population which was nonfarm was employed as the independent (X) variable. The dependent variables, the median income of farm families and unrelated individuals (Y), and the median

¹ The United States is divided into homogeneous sections termed state economic areas. The delineation was the result of combining counties with similar economic and demographic characteristics. In 1954, Bogue and Beal combined the state economic areas into 13 economic regions and 119 subregions. Bogue, Donald J., "An Outline of the Complete System of Economic Areas," *Amer. J. Sociology*, LX, pp. 136-9, Sept. 1954.

income of nonfarm families and unrelated individuals (Z), were compiled from 1950 census statistics.⁸

Tabulations were made deriving coefficients of determination and regression equations for the nation and each of the 13 regions. These statistics are presented in Tables 1 and 2.

The analysis indicates that within the nation as a whole the income levels attained by both the farm and nonfarm sectors bear a direct and positive relationship to the relative level of local urbanization. For the nation a closer relationship exists between urban development and nonfarm income than between urbanization and farm income.⁹

The degree of relationship between income and urbanization is expressed by coefficients of determination: farm income $r^2 = .151$, non-

TABLE 1. STATISTICAL RELATIONSHIP BETWEEN THE MEDIAN INCOME OF FARM FAMILIES AND UNRELATED INDIVIDUALS IN 1949 AND THE NONFARM PERCENTAGE OF TOTAL POPULATION IN 1950

Region	Regression equation ^a $Y = a + bX$	Standard error of regression	Coefficient of determination r^2	Arithmetic mean	
				\bar{Y}	\bar{X}
United States	\$ 639.46 + \$17.43	\$ 5.37	.151	\$1,768.20	64.7
I	516.46 + 18.19	3.85	.382	2,067.55	85.2
II	815.95 + 14.06	5.41	.144	1,983.05	82.9
III	20.72 + 25.26	9.89	.214	2,152.85	84.3
IV	984.66 + 12.85	4.97	.182	1,829.84	65.7
V	1,613.56 + 11.50	4.66	.144	2,342.21	63.3
VI	2,166.54 - .53	5.41	.0003*	2,134.41	60.3
VII	561.83 + 13.70	1.79	.407	1,281.89	52.5
VIII	478.99 + 9.61	2.10	.203	974.36	51.5
IX	583.82 + 11.02	4.44	.150	1,387.90	72.9
X	396.16 + 17.91	5.67	.156	1,416.18	56.9
XI	1,945.12 + 1.09	7.42	.0007*	2,024.09	71.9
XII	4,133.26 - 21.06	10.70	.144*	2,498.88	77.5
XIII	1,761.03 - 6.24	5.30	.068*	2,268.71	81.3

^a X = percent of total population not on farms, 1950.

Y = median income of farm families and unrelated individuals, 1949.

* Not significant, employing F-test at .05 level.

NOTE: Statistics for Regions VII, VIII, IX, and X were compiled from data in Sinclair, Lewis S., "Urbanization and the Incomes of Farm and Nonfarm Families in the South," *J. Farm Econ.* 39:1 (May 1957), 510-517.

The sampling plan was designed to estimate median income within 10 percent with 95 percent confidence.

⁹ Median income equals the value that divides the distribution into two equal parts. Two facts should be noted in regard to the median farm income figures: First, median income figures represent net cash income; hence, farm income includes not only the income from farming operations but also income from nonfarm employment and income from other sources. Second, median farm income figures do not include the value of payments in kind and perquisites which are important components of the income statistics in certain sections.

⁸ These results are consistent with the findings of Ruttan, who employed an identical measure of urbanization. Ruttan, Vernon W., "The Impact of Urban-Industrial Development on Agriculture in the Tennessee Valley and the Southeast," *J. Farm Econ.* 37:1, Feb. 1955.

TABLE 2. THE STATISTICAL RELATIONSHIP BETWEEN THE MEDIAN INCOME OF NONFARM FAMILIES AND UNRELATED INDIVIDUALS IN 1949 AND THE NON-FARM PERCENTAGE OF TOTAL POPULATION IN 1950

Region	Regression equation* $Z = a + bX$	Standard error of regression	Coefficient of determination r^2	Arithmetic mean	
				\bar{Z}	\bar{X}
United States	\$ 684.88 + \$21.58	\$5.69	.314	\$2,102.44	64.7
I	595.36 + 25.32	6.19	.317	2,753.61	85.2
II	1,070.92 + 15.94	6.68	.124	2,393.67	82.9
III	796.14 + 22.62	7.11	.296	2,705.46	84.3
IV	1,056.60 + 18.60	4.56	.356	2,279.72	65.7
V	1,186.91 + 17.62	3.97	.353	2,303.47	63.3
VI	1,504.17 + 13.62	2.92	.428	2,326.48	60.3
VII	608.01 + 19.41	1.97	.539	1,628.42	52.5
VIII	823.94 + 13.80	2.58	.257	1,535.15	51.5
IX	221.90 + 20.42	5.20	.334	1,711.30	72.9
X	791.70 + 16.13	3.61	.281	1,710.30	56.9
XI	1,188.01 + 15.07	7.80	.102*	2,272.37	71.9
XII	3,025.41 - 3.15	7.55	.008*	2,780.24	77.5
XIII	1,621.32 + 9.10	7.09	.080*	2,362.19	81.3

* X = percent of the total population not on farms, 1950.

Z = median income of farm families and unrelated individuals, 1949.

* Not significant, employing F-test at .05 level.

NOTE: Statistics for Regions VII, VIII, IX, and X were compiled from data in Sinclair, Lewis S., "Urbanization and the Incomes of Farm and Nonfarm Families in the South," *J. Farm Econ.*, 39:1 (May, 1957), 510-517.

The sampling plan was designed to estimate median income within 10 percent with 95 percent confidence.

farm $r^2 = .315$. Thus, approximately 15 percent of the variation in farm income and 31 percent of nonfarm income is associated with variation in the relative level of urbanization. The regression equations, $Y = \$639.46 + \$17.43X$, $Z = \$684.88 + \$21.58X$, indicate that as a county's nonfarm population increases one percent, farm income increases on the average approximately \$17, while nonfarm income is enhanced by \$21.

These statistics provide a benchmark of comparison; however, the economic conditions within the nation vary so widely that few inferences can be drawn from them. Then a pertinent question in dealing with the analysis becomes: What percentage of the variation in income would urbanization be expected to explain? The national statistics will be employed as a yardstick for ranking the magnitude of the influence of urbanization. Then, if urbanization explains 15 percent of the variation in local agricultural income, there appears to be evidence in support of the hypothesis. It would seem logical to expect an even closer association between urbanization and nonfarm income.

The association appears to be strongest in the Atlantic Metropolitan Belt (I) and Lower Great Lakes (III) regions. In both areas r^2 exceeded .21. In the Southern regions, the Central and Eastern Upland (VII), the Southeast Coastal Plain (VIII), the Atlantic Flatwoods and Gulf Coast (IX), and the South Center and Southwest Plains (X), the influence is

more pronounced than for the nation as a whole and in the Central and Eastern Upland (VII) and Southeast Coastal Plain (VIII) regions, the association was particularly strong. The Upper Great Lakes (IV) region also ranks above the national level.

A similar pattern develops when the coefficients of determination between nonfarm income and urbanization are ranked. The relationships again are strongest in the Atlantic Metropolitan Belt (I), the Lower Great Lakes (III) and the southern regions. Two regions, the Southeast Coastal Plain (VIII) and the South Center and Southwest Plains (X), do fall slightly below the national level; however, in each, over 25 percent of the variation in nonfarm income is explained by local urbanization. As with farm income, nonfarm income is closely associated with local urbanization in the Upper Great Lakes (IV) region. Two additional regions, the Corn Belt (V) and Central Plains (VI), also have a high degree of correlation between nonfarm income and urban industrial development.

The regression equations further attest to the direct relationship between income levels and urbanization in the Atlantic Metropolitan Belt (I) the Lower Great Lakes (III), the Upper Great Lakes (IV), and across the Southern regions. In the Southeast Coastal Plain (VIII) region, the influence of urbanization is not as marked, but even here a one percent increase in nonfarm population adds approximately \$10 to farm income. Urbanization exerts a fairly important influence on both farm and nonfarm income in the North Center (Corn Belt, V) region, but westward into the Central Plain (VI) region, the effect becomes unimportant.

These statistics develop an interesting geographic pattern of the influence of urbanization on the income producing ability of both the farm and nonfarm sectors of the economy. The influence of urbanization is apparently most striking along the eastern seaboard from Boston southward to Richmond, Virginia and around the southern industrial fringe of the Great Lakes. The effect of urbanization on income levels in the South is also important, as it is in the cut-over lakes regions of Minnesota, Michigan, and Wisconsin. Moving westward the relationship is still marked in the Corn Belt but fades in the Great Plains. In the intermountain district and the far western states, income levels are not significantly related to the magnitude of the local urban-industrial complex.

III

The problem then expands into an identification of the conditions under which the hypotheses may be expected to hold and the conditions contributing to their rejection. It is recognized that a simple regression of income on the percent of a county's population which is nonfarm may be a somewhat imprecise analytical tool. A large portion of the influence of urbanization on the level of local agricultural income is transmitted

through four markets: the labor market, the land market, the capital market and the markets for agricultural produce. The actions and efficiencies of these markets explain in large part the varying degree of urban influence within the several regions. Figure 2 is presented to aid in the interregional comparison of components of the capital and labor markets. The number of farm operators reporting 100 or more days of off-farm employment, the net migration and the relative levels of farm and nonfarm income give some approximation of the efficiency of the labor markets. The percentage of Class I and Class II farms within a region provide a crude indication of the size and profitability of its farming units and may give some insight into the character of the capital market.

The high degree of association between income levels and urbanization observed in the Atlantic Metropolitan Belt (I) and the Lower Great Lakes (III) regions is not surprising in view of their characteristics. The extensive and diversified industry provides employment opportunities and a vast market for both the farm and nonfarm sectors of the economy. Part-time farming opportunities are prevalent near many of the metropolitan areas and outstanding educational and transportation facilities create the atmosphere necessary to take advantage of these nonfarm employment opportunities. The labor and product markets appear to be the main vehicles through which the influence of urbanization is transferred to agricultural income.

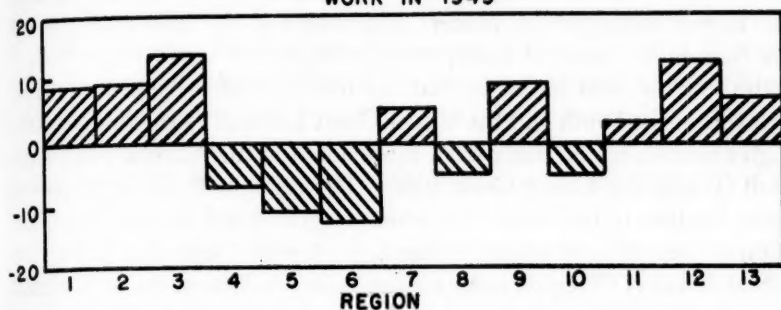
The receipts from the sale of fluid milk are an important component of the agricultural income of both regions. Marketing institutions in the Atlantic Metropolitan Belt (I) region have been developed which favor producers situated close to urban centers. These institutional arrangements of nearby price differentials and individual handler pools with plants nearest urban centers having a higher percentage of fluid utilization also carry over into the Lower Great Lakes (III) region. High land values, flexible truck transportation, and proximity to huge markets indicate that intensive poultry, vegetable and specialty crops provide the best farming alternatives for many operators within these regions. With the prices of the output determined in the local markets, farming is closely tied through the product market to the local urban centers.

In both regions, banking and credit facilities are well developed permitting farm operators to obtain the necessary capital to improve production functions and expand their operations.

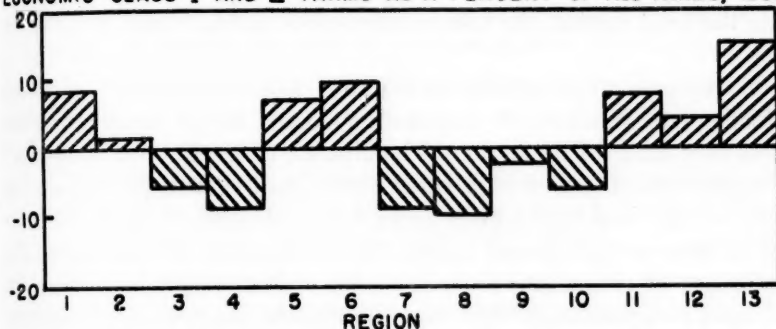
As might be expected, differentials in urbanization exert a substantial influence on the level of nonfarm income in these regions. In both, nonfarm income averaged more than \$2,700 and the percentage of the county's nonfarm population exceeded 84 percent. It may be assumed that a

FIGURE 2. DEVIATION OF ECONOMIC REGIONS FROM UNITED STATES AVERAGE FOR SELECTED FACTORS IN 1950.

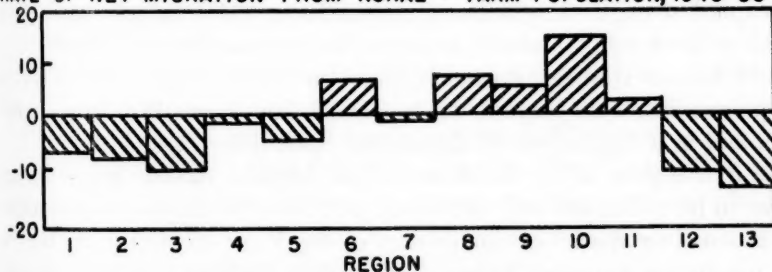
PERCENT FARM OPERATORS REPORTING 100 OR MORE DAYS OFF-FARM WORK IN 1949



ECONOMIC CLASS I AND II FARMS AS A PERCENT OF ALL FARMS, 1950



RATE OF NET MIGRATION FROM RURAL - FARM POPULATION, 1940-50



CLASS I FARMS HAVE SALES PER FARM OF \$25,000 OR MORE. CLASS II FARMS HAVE YEARLY SALES BETWEEN \$10,000 AND \$24,999.

SOURCE: MAITLAND, SHERIDAN T., AND FISHER, DOROTHY ANNE, "AREA VARIATIONS IN THE WAGES OF AG. LABOR," U.S.D.A. TECHNICAL BULLETIN NO. 1177, MARCH, 1950, (WASHINGTON: GOVERNMENT PRINTING OFFICE), p. 29

large portion of this urban population resided in large cities. After a comprehensive study of the effect of a city size on income levels, Mansfield noted that in the United States as a whole, there is a consistent tendency for the level of income to rise as city size increases. The level of income in the largest metropolitan centers was found to be about 25 percent higher than in the smallest incorporated villages.¹⁰

Analysis of the data indicates that the influence of urbanization on income levels in the South and the Upper Great Lakes (IV) region is exerted through channels which differ from those noted in the Atlantic Metropolitan Belt (I) and the Lower Great Lakes (III) regions. For a large part of the farm families in the South, the level of agricultural income is a direct function of the prices of cotton, tobacco, fruit, sugar, and rice. In the Upper Great Lakes (IV) region farm income is dependent on the sale of milk for manufactured dairy products. Since a relatively small proportion of this production is used in local markets and the prices are established outside the local market, the interrelationship is not through the product market.

Underemployment, reluctance to migrate, poor transportation facilities and inadequate transfers of information create highly localized labor markets over much of the regions. The absence of local nonfarm employment opportunities plus a high rural birth rate has brought population pressure on the local land supply and a low evaluation of the net contribution of labor to agricultural output. The excessive land values plus the capitalization of cotton and tobacco quotas are important barriers to internal farm reorganization. Any expansion in the magnitude of local industry would be expected to relieve population pressure and attract outside capital, strengthening banking and credit facilities, thereby providing stimuli to farm reorganization necessary to improve income levels.

Farm income statistics do not include the value of payments in kind and perquisites. This may be an especially important distortion in the South and in a region heavily dependent upon dairy production.

The four regions of the West are unique because income levels do not appear to be associated with urbanization. Either the impact of urbanization is small or spatial characteristics of the West so diffuse it, that it does not appear in county income differentials. Perhaps economic growth outside major western industrial centers is primarily resource oriented.

Considering the diversity of industrial development and the varied agriculture regions, one's first reaction to statistics indicating no significant relationship is one of doubt. A rationale for the findings will be developed in a series of four hypotheses.

¹⁰ Mansfield, Edwin, "City Size and Income, 1949," *Regional Income*, Vol. 21, table 7, p. 289.

1. Between 1930 and 1950, the population of the Pacific states increased by 88 percent while that of the United States increased by only 26 percent. Over the same two decades returns to labor declined relative to the rest of the nation. In 1930 per capita income of the Pacific states was 27 percent larger than for the nation; by 1950 the advantage had dropped to 19 percent. It may then be hypothesized that the influx of migrants has mitigated the expected influence of the surging industrial activity. Workers from lower-income regions were willing to take up increasing employment opportunities at lower wage levels. It may be further hypothesized that these wage rates are below the transfer price of many of the local agricultural workers.

2. It has been hypothesized in earlier sections of this paper that the character of the market for agricultural products may in part determine the degree of association between farm income and urbanization. Wheat, livestock, irrigated cotton, citrus, vegetables and specialty crops determine a large part of the agricultural income of the regions. For all of these commodities demand and price are determined on the national market with local markets relatively unimportant. The regions also boast powerful cooperatives whose activities take over many of the utility functions of the marketing channel.

3. The sparse scattering of urban centers over the western states means that the influence of one urban center may be dispersed over a wide geographic area. Service, marketing and credit facilities extend beyond county lines indicating that the index of urbanization may have some limitations in the West. For example in a sparsely populated county one urban center, even though small and providing few employment opportunities, may indicate that a high percent of the county's population is nonfarm.

4. The immobile resources, especially agricultural land, timber and mining properties, have unquestionably increased in value as the economy of the West boomed. In the Pacific Northwest (XII) region, an extremely high proportion of the farm operators reported 100 or more days of off-farm employment. Many of these part-time opportunities are with local logging and lumber operations. Logging operations are not ordinarily located in counties with strong urban influence.

While the number of Class I and II farms in the region indicates that farming operations are highly organized, off-farm income undoubtedly contributes to the average farm income of \$2,500, highest in the nation. Part-time employment may also have provided the capital necessary for an improvement in production functions and the consequent higher income. It is hypothesized that the attributes and current value of timber, fertile land which is adaptable to technology, and mineral resources are

apparently stronger influencing factors on local income than is urban industrial development. Also, throughout much of the West, the crucial relationship between water resources and economic growth persists, while in other areas of the nation the influence of natural endowments has dissipated more rapidly.

Service and transportation communities are necessary to insure efficient production and marketing, but it seems apparent that the prosperity of agriculture may be independent of urban development. In many of the counties high levels of nonfarm income are obtained with relatively low levels of industrial development. Indeed this nonfarm income may be a function of a highly organized and prosperous agriculture rather than industrial employment opportunities.

IV

The degree of association between the level of income attained by farm and nonfarm families and the magnitude of the local urban-industrial complex is a function of and hence varies as widely as the characteristics of the agrarian and industrial sectors of the nation's economy. The results of this study would indicate in the Atlantic Metropolitan Belt (I), the Lower Great Lakes (III), the Upper Great Lakes (IV), the Central and Eastern Upland (VII), the Southeast Coastal Plain (VIII), the Atlantic Flatwoods and Gulf Coast (IX) and the South Center and Southwest Plains (X) regions, local urban-industrial development exerts a significant and positive effect on the level of income obtained by farm and nonfarm families. A similar statement cannot be made concerning the western regions. Analysis of these latter areas provides adequate evidence to conclude that high levels of agricultural income can be obtained without substantial local urbanization.

There is a close association between farm income and the level of local urbanization throughout the South and the cut-over lakes area. Both of these sections contain low-agricultural-income problem areas. The findings seem to provide benediction for the policy position of those who feel that improvements in wage rates and living levels of the impoverished farmers in these areas can be accomplished by research designed to improve the mobility of the human agent. In the same vein efforts should be continued to encourage industry into these areas.

ECONOMIC DEVELOPMENT AND CHANGING CONSEQUENCES OF RACE DISCRIMINATION IN SOUTHERN AGRICULTURE

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I. Economics of Race Discrimination

DISCRIMINATION against some group or groups on grounds of religion, race, personality, or other non-pecuniary considerations has always been a part of man's recorded history. Yet, the economics of race discrimination has been almost completely unexplored until recently. The definitive work of Gary S. Becker in his book, *The Economics of Discrimination*,¹ provides for the first time a theoretical framework within which discrimination as a market phenomenon may be systematically analyzed and understood. His contribution is all the more worthy in that it is exceedingly rich in empirical content.² Prior to his trail-blazing work, studies on discrimination were for all intents and purposes the exclusive domain of the sociologists and psychologists. Efforts were largely limited to discovering the determinants of the taste for discrimination. The economic question as to exactly how individual tastes for discrimination interact with other variables (such as the distribution of tastes, the relative importance of the group discriminated against, the degree of complementarity or substitutability involved, and the competitiveness of the factor and product markets) and jointly determine observable market discrimination was left unanswered.

If *W* is the group discriminating against another group called *N*, market discrimination is measured by Becker as the difference between the ratio of *N*'s and *W*'s wage rates (or incomes) and that ratio which would exist under competitive equilibrium in the absence of discrimination (p. 14). In the special case where *W* and *N* are perfect substitutes, market discrimination becomes the simple percentage difference between *W*'s and *N*'s wage rates (p. 9). *W* is said to have a taste for discrimination against *N* if he acts as if he incurs "non-pecuniary, psychic costs" in either working with *N* or employing *N* or hiring out inputs to *N* or consuming *N*'s products. Viewed from the standpoint of international trade theory, the economic

* The writer wishes to express particular appreciation to Mamoru Ishikawa for his excellent graduate assistance; to William H. Nicholls and Jack Guenther for their ideas; and to the Rockefeller Foundation for its generous financial aid in support of a continuing study of Southern economic development of which this paper is a part.

** On leave, 1959-60, to Osaka University, Japan.

¹ The University of Chicago Press, 1957, pp. x, 137.

² For example, he was able to estimate that "Individuals in the South appear to have had, on the average, slightly less than twice as much taste for discrimination as those in the North" (p. 102).

consequences are clear. Suppose W and N are two separate societies. As long as resource proportions for W are different from those for N, both groups will find it to their advantage to "trade" their relatively abundant factors for the relatively scarce factors. Under competitive equilibrium with no discrimination, the prices of all homogeneous factors are equalized and equal to their respective marginal productivities. The solution is independent of any distinction between W and N. The incurrence of non-pecuniary costs by W in associating with N in the productive process prevents the equalization of factor prices. The necessary outcomes are reduced factor movement between W and N (i.e., some market segregation arises) and reduced incomes for both W and N.³

Let us now change the model somewhat by taking two farm communities A and B with similar individual tastes for leisure, identical resource proportions, homogeneous factors, identical type of farming, and common technology. By homogeneous factors we mean among other things perfect substitutability between Negro and white labor. Clearly these two communities would realize identical incomes. Suppose A has a completely white population and B a mixed population. The white population has some taste for discrimination against the Negro. Among B's white population capital is relatively abundant; among its Negro population, labor.⁴ Under the close identity between the farm firm and the household, the firm typically employs unpaid family workers only. Market discrimination, therefore, takes the form of more restricted command over resources on the part of the Negro (resulting in less capital and land per Negro-operated farm and per Negro worker) instead of wage differentials between races. The expected consequence is that B's total factor income is reduced such that its per capita income falls below that of A despite the similarity of their given conditions. Note, however, that the argument is completely rigorous only because of the implicit assumption of given and invariant labor (and other) resources. What if discrimination in B gives rise to a substantially larger total labor input than is obtained under no discrimination? The above consequence of discrimination need no longer follow, since B's more intensive use of available labor may now offset its relatively inefficient use of all resources.

³ Except in the unlikely event where free trade of commodities, by permitting specialization along lines requiring varying optimum input combinations, equalizes factor prices without any trade of factors under certain restrictive conditions. In such an event, complete segregation, though not in commodity trade, has no negative income effect. Generally, the incomes of both W and N are decreasing functions of segregation since the unlikely exception is valid only if tastes of discrimination do not influence consumption.

⁴ This is a necessary condition. Otherwise, even slight taste for discrimination leads to complete economic segregation between the two groups. But this will have no income implication whatever on either group or on the community.

The purpose of this paper is three-fold: (1) To consider a theoretical framework within which a discriminatory factor market might produce income implications at variance with those normally expected. (2) To investigate its empirical validity and the role played by economic development in influencing the consequences of discrimination. (3) To gain insight into the role played by a discriminatory educational system in Southern agricultural development.

II. Role of Education

The role of education requires elaboration. If labor's productive capacity is a function of education and if the Southern Negro historically received less and poorer quality education than the white, market discrimination is no longer a necessary condition for the unequal resource command between the two races. Imperfect substitutability alone can lead to smaller Negro farms. But if this were the case, there is all the more reason to expect the normal economic consequence, i.e., relatively low income in Community B. Let c represent the size of the Negro farm or the amount of capital (including land) per worker on the Negro farm and ac that for the white, where a is greater than 1; then the expected income effect against the Negro (and Community B) is greatest if the factor a is accounted for completely by the race difference in productive capacity and smallest if it results altogether from market discrimination. In the latter case, a may be regarded as a measure of market discrimination. If a is a combined result of both, the income effect is somewhere between the two extremes.⁵

However, it can be plausibly hypothesized that, in underdeveloped economies where agriculture is traditional with regard to both crops grown and farming practices, education bears little relationship to productivity. This relationship improves as agricultural and general economic development reaches the stage where dynamic changes in technology and market forces require complex decision-making. Under the hypothesis, the lesser education of the farm Negro might not detract from his productivity in traditional agriculture. Earlier we have argued that the expected income implication of market discrimination may be negated by the family labor

⁵ Under given discrimination a and given resources, the average amount of resources per Negro farm c (and per white farm $a c$) becomes a function of the relative importance of the number of Negro and white farmers, n_1 and n_2 respectively. It can be shown that if c_0 is the average farm size of a community the average Negro farm size is given by:

$$c = c_0 \frac{n_1 + n_2}{n_1 + an_2}.$$

The average white farm size is of course given by ac .

The above equation means that, if n_1 is infinitely large relative to n_2 , then c tends toward c_0 . If n_1 is infinitely small relative to n_2 , c tends toward c_0/a .

being more intensively employed. As the following section will make clear, this proposition can be more broadly stated as a hypothesis relating the income implication of market discrimination (as distinct from discrimination in education) to economic development. The two hypotheses are thus complementary in that both express economic consequences arising from given amounts of discrimination (in education and at the market place) against the Southern farm Negro as functions of the level of economic development. If these hypotheses are not inconsistent with empirical findings, certain significant conclusions can be drawn from them. The following section presents a theoretical framework within which the labor input response within the firm-household complex may be related to varying amounts of the firm's non-labor resources under the family's given leisure preference.

III. A Theoretical Framework

If we define subsistence wage as that wage which "forces" the working population to offer the maximum amount of labor in order to subsist, the early history of Western Industrial Revolution as well as the experiences of today's over-populated economies amply attest to the empirical validity of the concept. Extremely low wages can bring forth not only maximum working hours but also the participation of child labor in the work force. It is a foregone conclusion as to what will happen to the quantity of labor supplied when wages rise. Children and women drop out of the labor force. Those who remain reduce the offering of their services. As wages continue to increase the former's re-entry together with the latter's increased offerings change the direction of labor supply response. This continues until one reaches the well-known backward bend in the supply function. Although it is plausible to assume shifts in preference in the process, this is not necessary to produce the results indicated. Getting away from the wage system and back to the firm-household complex, the path showing equilibrium output of the firm and equilibrium labor input of the household under varying amounts of firm resources can also assume the general shape of an inverted S.

Fig. 2 shows such a path, RR, as derived from the S-shaped expansion path, EE, in Fig. 1. P_1, P_2 , etc. represent the production possibilities curves where income and leisure are the substitute products. Each curve corresponds to a given amount of non-labor resources. Total labor available for work on family farm is equal to L_0L_1 and invariant with the size of the firm.⁶ I_1, I_2 , etc. represent the farm family's indifference curves. OL_0 shows

⁶ In the study area employed in this paper, Negro farms on the average showed larger family work force (4.3 persons aged 15 or over in 1940) than white farms (3.7). But after allowing for Negroes working on white farms and all members of the farm population on nonfarm jobs, the work force per farm was virtually the same on Negro and white farms (1.7 and 1.5 respectively).

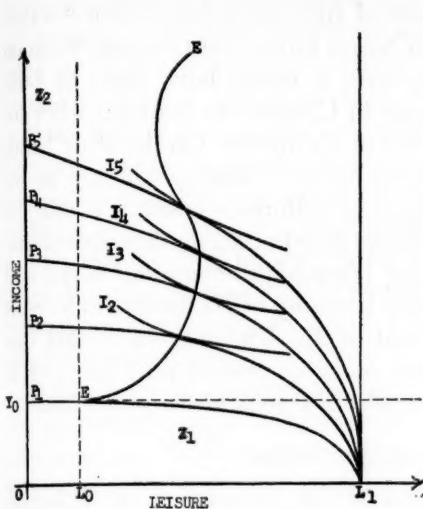


FIGURE 1. EQUILIBRIUM UNDER FIRM-HOUSEHOLD COMPLEX

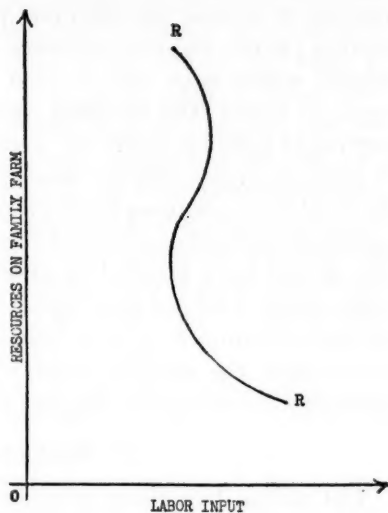


FIGURE 2. EQUILIBRIUM LABOR RESPONSE UNDER VARYING FIRM RESOURCES AND GIVEN FAMILY LABOR FORCE

the absolute minimum requirement for "leisure," while OY_0 represents the minimum subsistence income. Both minima are defined as representing that amount of "leisure" or income below which the marginal rate of substitution of leisure for income is zero or infinite respectively. Thus, the indifference curves do not extend into the zones bounded by the minima lines and the axes. In Z_1 all points with higher income coordinates (regardless of their leisure coordinates) are preferable to some point with lower income coordinate. In Z_2 all points with higher leisure coordinates (regardless of their income coordinates) are preferable to some point with lower leisure coordinate. The general shape of P assumes decreasing marginal rate of product substitution (income for leisure), hence, decreasing marginal productivity of labor. Competition in the market for farm products is assumed, so that physical and value productivities differ by a scale factor representing product price. It should be pointed out that an expansion path such as EE (Fig. 1) does not require indifference maps that violate the consistency and transitivity conditions. Abstracting from seasonal variations in farm labor requirements, P_1 embodies the amount of resources per farm in a truly over-populated country. These resources are such that they require the cooperation of maximum labor input (L_0L_1) to yield subsistence (OY_0) for the existing population. At that point, as the nearly horizontal portion of P_1 indicates, the marginal productivity of labor may be expected to be quite near to zero.

Now, if under no discrimination both white and Negro farms typically

operate at or near the inflection point of RR's lower bend, then discrimination (which reduces resources on Negro farms and increases those on white) would have caused some increase in family labor input on both types of farms. The resulting increase in Community B's total labor input could suffice to avert any lowering of B's income. On the other hand, if with general economic development and the concomitant rise in individual farm resources the typical farm of both races operates within the positively inclined reaches of RR under no discrimination, then discrimination would have resulted in offsetting labor adjustments on Negro and white farms. And one may expect some lowering of B's income as a result of discrimination to a level below that of A's. Under given market discrimination, the resulting contraction in labor offered (and income) is greatest when farms operate near the inflection point of the upper bend.

IV. Methodology and Setting

The central hypothesis of the paper is that, because of the S-shaped path which responses of farm labor to changes in farm resources may take, market discrimination in agriculture, as measured by unequal resource allocation to Negro and white farmers, may produce different income consequences depending on the stage of the economy's development. In "early" stages of development when farms typically operate at near subsistence a given difference in the amount of resources on Negro and white farms may produce little or no impact upon per capita income. As the economy advances, typical farms of both races begin to show positive labor input response to increases in farm resources. At that stage, the same amount of race discrimination will noticeably lower the overall per capita income. These are the consequences of the hypothesis. These consequences are further strengthened by a complementary hypothesis that race discrimination in the field of public education has little effect on productivity in traditional agriculture, but may have important influences in developed economies where decision-making becomes complex even in agriculture.

The historical and empirical setting is provided by studying a group of 21 Southern Piedmont counties⁷ since 1900. Although the level of subsistence need not be invariant with time, there can be little doubt that in 1900 and even in 1940 the typical Piedmont farm, particularly the Negro-

⁷The group includes 11 Georgia counties (Banks, Barrow, Elbert, Franklin, Gwinnett, Hall, Hart, Jackson, Madison, Stephens, Walton) and 10 South Carolina counties (Anderson, Cherokee, Chester, Greenville, Lancaster, Oconee, Pickens, Spartanburg, Union, York). The counties lie directly between Atlanta, Georgia and Charlotte, North Carolina. They are the same counties the writer has investigated in a number of earlier studies.

operated farm, was much closer to subsistence than it was in the prosperous postwar years. The Piedmont farms relied primarily upon unpaid family workers, so that the absence of a wage system left the way open to increasing input of family labor to where marginal physical labor productivity falls to zero, should the maximization of output become the primary goal under stringent resource conditions. Alternative off-farm employment was rather limited in the short run, so that foregone leisure, not income from alternative employment, constituted the opportunity cost of farm employment for the family labor. The number of workers can therefore be considered fixed to the family farm. Only the intensity of the input of available family workers is variable. These are the conditions that underlie the S-shaped equilibrium labor response curve.

In all years to be investigated, there was substantial market discrimination against the Negro in agriculture as reflected by the differences in the amount of per-family or per-worker land and capital between the two races. Moreover, although available census data are limited, the indication is that the extent of market discrimination, if measured by the ratio of Negro resources per farm or per worker to those for the white, appears to have been relatively constant over time.⁸ Historical county school expenditure data also indicate chronic discrimination in education throughout the period relevant to the study. The rapid narrowing in the race differences in school expenditures per student enrolled took place during the last decade and will not be reflected in economic statistics until sometime later. While for the Piedmont study area as a whole discrimination seems relatively independent of time, important variations among counties have been present in all years in this regard. In general, discrimination appears significantly correlated with the relative importance of the Negro. In both 1940 and 1950, for instance, the correlation coefficient between the percentage of farm population Negro and a number of measures of Negro resources (value and acres of farmland, implements, etc.) relative to white resources per farm and per worker is in most cases significantly negative, ranging from -0.32 to -0.62 .⁹

⁸Note Becker's findings: "... neither striking increases nor striking decreases in discrimination against Negroes have occurred during the last four decades" (p. 125).

⁹These statistical relationships, however, do not tell us whether the explanation lies in stronger tastes for discrimination in more heavily Negro-populated counties or in the effect of relative Negro numbers acting independently upon market discrimination under similar tastes in all counties. Relative importance of Negroes exerts independent influences in that (factor) market discrimination is given by the marginal discriminator (factor supplier) whose position in the distribution of individual tastes for discrimination is determined by relative Negro numbers. Thus, even if the distribution of individual tastes were identical in all counties, relative Negro numbers influence market discrimination as long as individual tastes are heterogeneous. (See Becker's monograph, Ch. III.) (Footnote continued on page 1120)

It is also to be noted that county variations in discrimination can not be explained by county differences in tenure composition. Negro sharecroppers consistently reported less land and capital than white counterparts. This is the group where landlord tastes for discrimination are given free expression. Consistent differences are also found in other tenure groups. Therefore, the argument that the observed market "discrimination" may be a simple reflection of an imperfect factor market operating against *all* persons without sufficient owned assets is unwarranted, although Negroes do fall more heavily in the "lower" tenure groups.¹⁰

Because of space limitations, the supporting data are not presented here. However, I do not believe anyone familiar with Southern agriculture will seriously dispute these assertions, particularly since the trends in discrimination are consistent with Becker's findings for the nonagricultural

An indirect test can be made to determine whether tastes for discrimination differ among counties provided a particular assumption is made. This assumption is that members of local school boards are representative of the voters regarding tastes for discrimination. On the average then, they tend to represent the average taste in the distribution of the several counties. If tastes were constant among counties, local school boards should show similar tastes in all counties and the effective discrimination against the Negroes in schools should be invariant with their relative numbers.

For both 1900 and 1940, the correlation between relative school expenditures per Negro student (or per capita for Negroes) and relative Negro numbers (all relative to whites) yields highly negative coefficients of -0.71 and -0.67 (-0.78 and -0.75) respectively. This suggests not only that tastes for discrimination varied among counties during 1900-40 but that they appeared to be associated with relative Negro importance. That being the case, one can only conclude that both tastes and relative Negro numbers acted independently on the extent of discrimination in the factor markets serving agriculture.

It is interesting to note that by 1950 the same correlation dropped to virtually zero ($+0.02$). A plausible speculation is that, in the South's general postwar push to put real substance into the slogan "separate but equal facilities," relative expenditures on Negro students no longer reflect differential tastes but some other factor such as the fiscal capacity and policy of local administrative units. The region's efforts to equalize expenditures among races are apparently intended to ward off desegregation by showing nondiscrimination.

¹⁰ Race disparity in farm resources is greater among the "higher" tenure groups. This need not mean greater discrimination against Negroes in these groups. Imperfect (but color blind) markets alone can account for this since Negro cash renters, owners, and part-owners generally have fewer owned resources. For this reason resource disparity between the two races in the sharecropper group is probably a purer indicator of the extent of market discrimination, particularly insofar as sharecroppers seldom exercise independent decision-making (hence, differences in educational attainment between Negro and white sharecroppers likely give little rational basis for differential resources among races). In 1940, our estimates based on census returns show that in the Southern Piedmont the value of land and capital per worker on Negro sharecropper farm was 25 percent less than that on white sharecropper farm. This may be taken as a rough measure of the extent of market discrimination against the Negro in Southern agriculture.

sector. What may be the consequences of race discrimination in Southern agriculture as gleaned from the Piedmont setting?

Ignoring our hypotheses, one would expect to find for all years higher farm incomes per worker or per farm person in counties with smaller relative Negro farm population. This is all the more likely in view of (1) the Negro's lower capacity (due to less education received), (2) the historical fact that counties with heavier relative Negro farm population adjusted to lower overall resource-labor proportions, and (3) generally greater discrimination (i.e., greater relative resource differential among races) in counties with heavier relative Negro farm population. (This constitutes a relaxation of two of the *ceteris paribus* conditions in the hypothetical model on p. 1114 as well as a departure from the model's simple dichotomy.) On the other hand, the statistical findings would be consistent with our twin hypotheses if no *net* relationship appears between farm income per worker and the relative number of Negro farm persons in the early years (say, 1900 and 1940) and if this relationship emerges in more recent years (say, 1950 and 1954). The net relationship will be ascertained by the partial correlation technique. The other independent variables acting upon farm income to be statistically allowed for are: the index of industrial-urban development and the index of the type of farming. These are introduced with the view of approximating the *ceteris paribus* conditions stated earlier. Only the deviations from these conditions directly caused by unequal distribution of farm Negroes will be permitted.

The introduction of industrial-urban development attempts to make allowance for the following: (1) variations among counties in prices received and paid by farmers arising from the impact of a differential industrial-urban development upon the counties' product markets: (2) variations among counties in resource proportions and farm size where such variations are attributable to the effect of industrial-urban development (apart from those brought about by relative Negro numbers),¹¹ (3) variations among counties in per capita educational outlays where such variations are accountable by the effect of differential industrial-urban development (rather than by differences in race composition). Type of farming is introduced as a third independent variable to control the influence of short-run variations in yields and relative commodity prices upon the farm income of the counties.

¹¹ The Southern Piedmont area is investigated in this paper because of our earlier intensive studies of the area. In these studies, it was found that industrial-urban development exerted significant influences upon local agricultural organization through its impact upon the functioning of local product and factor markets. See, for instance, my book *Economic Development in the Southern Piedmont: Its Impact on Agriculture, 1860-1950* (The University of North Carolina Press, 1958), especially pp. 210-17.

V. Empirical Findings

Let:

- X_1 = Farm income per farm worker,
 X_2 = Index of type of farming
 X_3 = Index of industrial-urban development,
 X_4 = Percent farm population Negro.¹²

The correlation coefficients are based on linear relationships which appear quite satisfactory from the scatter diagrams. Although Table 1 contains a number of coefficients that throw light on some interesting side issues, we shall center our attention on the partial coefficient, $r_{14.23}$. This is the coefficient that should cast direct light on our hypotheses. As Table 1 shows, $r_{14.23}$ with values of -0.056 and $+0.176$ for 1900 and 1940 respectively can easily arise from chance alone. For the current decade, however, it shows substantial negative net relationship, -0.618 for 1950 and -0.391 for 1954. Although $r_{14.23}$ is significant only at the 5 percent level in 1954,¹³ it should be noted that the 1954 data, particularly the farm labor and farm income estimates, are quite crude, being derived from a series of estimations often based upon more or less arbitrary projections for want of better alternatives.

The empirical findings are thus consistent with our complementary hypotheses. Can either explain the findings? Or are there other plausible explanations for them? The hypothesis concerning the effect of education on labor productivity in agriculture can at best be a contributing cause for the observed relationship between income and discrimination over time. It alone cannot sufficiently explain the findings since it does not explain the absence of the net relationship during 1900-40. The hypothesis based on variable labor response under changing levels of economic development, on the other hand, can be a sufficient explanation in itself. However, its plausibility is definitely reduced if discrimination in education is taken to be capable of exerting influences on agricultural productivity even under traditional agriculture. It should be added here that the real break from traditional agriculture came to the South only after 1940.

To be sure, the findings can conceivably be explained by other hypotheses. For instance, the failure of market discrimination to reduce farm income during 1900-40 may be explained by specifying certain differences in preference between races with the Negro showing relatively stronger preference for income. The emergence of the negative income effect in recent years can then be explained by supposing that somehow these differences have disappeared or reversed themselves in the interim. When com-

¹² See footnotes to Table 1 for explanations, definitions, and sources.

¹³ A one-tail test is made since the direction of relationship is specified by our hypotheses.

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TABLE 1. SIMPLE, PARTIAL, AND MULTIPLE CORRELATION COEFFICIENTS FOR SOUTHERN PIEDMONT

 X_1 =Farm Income Per Farm Worker^a X_2 =Index of Type of Farming (as measured by percent improved farmland in cotton)^b X_3 =Index of Industrial-Urban Development (as measured by per capita nonagricultural payroll^c) X_4 =Percent Farm Population Negro^d

Correlation Coefficients	1899-1900	1939-1940	1949-1950	1954
r_{12}	+0.629	+0.531	-0.041	-0.071
r_{13}	+0.242	-0.507	+0.711	+0.401
r_{14}	+0.419	+0.329	-0.030	-0.109
r_{23}	+0.148	+0.035	-0.279	-0.282
r_{24}	+0.670	-0.041	+0.297	+0.364
r_{34}	+0.288	+0.502	+0.359	+0.376
$r_{12.3}$	+0.618	+0.596	+0.233	+0.048
$r_{12.4}$	+0.517	+0.577	-0.033	-0.034
$r_{13.2}$	+0.139	+0.577	+0.729	+0.399
$r_{13.4}$	+0.194	+0.419	+0.774	+0.480
$r_{14.2}$	-0.004	+0.414	-0.019	-0.089
$r_{14.3}$	+0.376	+0.100	-0.435	-0.306
$r_{23.4}$	-0.063	+0.064	-0.433	-0.486
$r_{24.3}$	+0.662	-0.068	+0.443	+0.529
$r_{34.2}$	+0.257	+0.504	+0.482	+0.536
$r_{12.34}$	+0.531	+0.607	+0.527	+0.260
$r_{13.24}$	+0.201	+0.468	+0.843	+0.532
$r_{14.23}$	-0.056	+0.176	-0.618	-0.391
$R_{1.234}$	0.648	0.731	0.843	0.537

^a Farm income corresponds to the census-reported value of farm products sold, traded, or consumed on farms. For 1949 and 1954 where the *Census of Agriculture* reported only value sold, farm consumption is estimated. For 1899 and 1939, income is gross; for the other years, it represents essentially value added by farming (net after fuel, seed, fertilizer, livestock purchased). Although value added is to be preferred, the absence of such major enterprises as broilers in the area before the 1940's meant relatively stable current production expenses as a proportion of gross output in all counties. At any rate, the net relationships between X_1 and X_2 or X_3 will be undisturbed by county differences in the relative importance of current inputs since they would be reflected in X_2 .

The number of farm workers is based on the census-reported number of persons on farms of 14 years of age or over (as reported by the *Census of Population*), adjusted downward to allow for estimated off-farm employment, school attendance, and lower productivity of the female worker. For 1899 and 1954, farm population of 14 or over is estimated.

^b Both improved land and cotton acreages are from the *Census of Agriculture*. The notion of improved land has been abandoned by the Census Bureau since 1940. For 1940 and 1954, total cropland acreage is used, instead, after minor adjustments.

^c Because of data limitation, value added by manufacturing per capita is used instead for 1899. For the other years, nonagricultural payroll represents payrolls originating in the manufacturing industries (*Census of Manufactures*) and in retail, wholesale, and service establishments (*Census of Business*). For 1949, the latter two censuses were not available, and the *Census of Manufactures of 1947* and the *Census of Business of 1948* are used instead.

^d Data on total and Negro farm populations are from the *Census of Population*. For 1900 rural populations are used in place of farm populations, unavailable before 1930.

pared with our "labor response" hypothesis—which requires neither the specified race differences in preference nor the particular direction of their historical changes—the above alternatives are clearly in violation of the principle embodied in Occam's razor or Law of Parsimony. Thus, pending future investigations, some claim to validity can be reasonably made for the hypothesis that relates the observed changes in the income implications of race discrimination in Southern agriculture to general economic development (which influences the general resource position of the farm firm of all regions).

VI. Some Implications of the Findings

First, a few words of caution are in order. Our findings do not mean that on near-subsistence monoculture farms the grim necessity of eking out a living under limited resources actually forces larger labor input from each family member over the year than is supplied on larger diversified farms. Limited resources usually preclude complementary enterprises that smooth out violent seasonal fluctuations in labor requirement. Thus, traditional small Southern cotton farms, both white and Negro, have always been noted for the strong seasonality of their labor requirement, marked by contrasting periods of hectic activities and almost complete inactivity. The stretching of family labor input takes place, when it does, during periods of already intense labor input. In those periods a really hard pressed farm family intensifies the input of unpaid family labor beyond the point better-off families care to go after weighing increased income against the leisure that must be foregone. This is a point that, unless thus clarified, may rest uneasy with some readers. However, it is merely a refinement of the theory and in no way weakens or modifies its substance.¹⁴

Many of us are familiar with the two outstanding modern economic paradoxes. The first is why the United States, generally understood to be relatively long on capital and short on labor, should (as Leontief has found) export goods that are relatively labor intensive and import goods that are relatively capital intensive. The second has to do with the puzzling phenomenon (commented on at length by T. W. Schultz) that American agriculture should have realized substantial gains in total output in recent decades without anything like commensurate increases in inputs. This is also clearly brought out by Alvin S. Tostlebe in his recent monograph, *Capital in Agriculture: Its Formation and Financing since 1870*.¹⁵ To these two paradoxes may be added a third. In terms of Tostlebe's data,

¹⁴ In general, it is important to distinguish between the resource-imposed "leisure" and the voluntary consumption of leisure at the expense of income.

¹⁵ National Bureau of Economic Research, Princeton University Press, 1957.

the Southeast has shown rather steady gains on the nation as a whole in relative per-worker farm capital during the first half of the century (from 21 percent of the U. S. average in 1900 to 41 percent in 1950). The region's relative gain in farm income per worker, on the other hand, has been negligible (46 percent in 1900 and 50 percent in 1950). In fact, considering all six census years in the period, the region's relative income showed no discernible trend but fluctuated between 46 and 51 percent (Table 2). Looking at the input-output data from a different perspective, we see that the Southeast experienced a nearly fifteen-fold increase in the current value of farm capital per worker (181 percent in real terms) as compared with a seven-fold increase for the nation (110 percent). Income-wise, the per-worker increase for the Southeast was thirteen-fold (267 percent in physical terms), only slightly higher than the twelve-fold increase for the nation (221 percent). Perhaps there are extenuating circumstances—such as increasing regional differences in the relative importance of current inputs¹⁶ and the impact of technology on regional agricultures with widely

TABLE 2. FARM INCOME AND CAPITAL PER WORKER, SOUTHEAST AS PERCENT OF U.S.^a

	1900	1910	1920	1930	1940	1950
Gross Income ^b	46.5%	51.1%	41.9%	47.9%	49.4%	50.3%
Capital ^c	20.8%	22.5%	26.5%	27.4%	34.6%	41.4%

^a Computed from Alvin S. Tostlebe, *op. cit.*, Tables 5, 7, and H-3.

^b Gross value of farm products sold or consumed on farms.

^c Includes value of land and buildings, implements and machinery, and livestock.

different types of farming—which might account in part for the paradoxical findings. But it should be noted that these findings, far from being paradoxical, are exactly what one would expect on the basis of the hypotheses proposed in this paper.

First, if the Southern farmer's lesser attainment in education did not have much effect on his productivity earlier, this very likely has not been the case in more recent years. Second, as the Negro farms gradually increased their resources they moved up the "labor response" curve in Fig. 2 along the lower negatively inclined portion. Thus, the full potential increase in output (either total or per worker) was not realized because of the concurrent decline (or stability) in equilibrium family labor input under given labor resources. However, as Negro farms continue to improve their resource position and move along the positively inclined portion of the curve, the incremental capital input will be accompanied by increased input of available family labor, leading to accelerated output increment. The latter phase apparently has been characteristic of the Northern farm.

¹⁶ Tostlebe's income data are gross while his capital data exclude all current inputs.

If the explanation offered here is valid, Southern agriculture can look forward to greater productivity increases in the future even if the rate of its capital accretion is no greater.

The notion of a low-level equilibrium trap is quite in vogue in current economic development literature in analyzing the unhappy state of today's underdeveloped economies. This analysis lends credence to the theory by adding a new argument to those already marshalled by the proponents of that thesis. To break out of the trap, an underdeveloped economy needs to improve its agriculture drastically in order to enable the typical farm to clear the negative lower reaches of the "labor response" curve in one jump. Otherwise, small gradual increment to non-labor resources, even though in excess of population growth, brings disappointingly small output increment, perhaps only to be overwhelmed later by the Malthusian population response. To clear this barrier in one jump is undoubtedly a difficult though not impossible proposition. Under the circumstances, abstracting from income distribution problems, the greatest output increment would be realized if available new resources (and techniques) are concentrated in that sector of agriculture where already-better-off farms might give positive labor response to improved resources at their command.

Or, alternatively, if new resources and techniques are to be broadly diffused, possible contraction in subsequent labor input may be prevented and greater output increment assured by increasing land tax with the object of controlling any rise in the "net" (after tax) production possibilities curve. It is perhaps more than a coincidence that Japan, which adopted such a policy (though for quite different reasons) during the Meiji era, should have experienced remarkable increases in farm output, thus laying the groundwork for later rapid general economic development.

THE IMPACT OF INDUSTRIALIZATION ON A RURAL COMMUNITY

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Introduction

THE idea that industrialization represents a "way out" for low-income rural areas has been kicked around for many years. Proponents of this idea argue that industry not only will alleviate unemployment and underemployment problems, but will bring general economic and social betterment. These arguments have fired the imagination of persons in leadership and action roles at all levels, from the local community to the nation. As a result there has been a tremendous effort to marry industry and agriculture. The magnitude of the effort to industrialize rural areas, plus the fact that industrialization has not always been successful has suggested the need for a systematic look at the impact of industry on rural communities. The study reported on here is an effort in that direction.¹ Its general aim was to test a series of hypotheses relating to the impact of new industry on a low-income rural area.

At this point it should be noted that there is an abundance of literature on the economic and social effects of rural industrialization and part-time farming. The Department of Agriculture Library reference list on low-income farm people published in 1955 included 782 separate entries. Approximately 150 of these dealt with aspects of off-farm employment and part-time farming.² Nevertheless, the present study is of interest for at least three reasons: (1) Most of the previous studies have concentrated on income factors and many are simply repetitive accounts of the same studies published in separate places. (2) Only one or two studies have attempted a longitudinal approach and these have usually omitted considerations of the impact of industrialization on social participation, community pride, and related social factors. (3) The space-time factor is, of course, unique.

The plan of this report is to give a short background account of the study area and procedures used and to present in brief descriptive fashion

* The authors were employed by the Department of Rural Sociology, Louisiana State University and the Farm Population and Rural Life Branch, AMS, USDA when this study was made.

¹ This study is one of a series of studies being done at several State universities in cooperation with the Agricultural Marketing Service of the United States Department of Agriculture. These studies relate to the Rural Development Program of the United States Government.

² Elizabeth Gould Davis, *Low-Income Farm People: A Selected List of References*, U. S. Dept. Agr. Libr. List No. 62 (Washington, 1955).

the findings. Where appropriate, reference is made to the findings of previous studies.

Background and Procedures of the Study

In order to fulfill the overall objectives of the study, it was necessary that it be done in a relatively low-income area where a sizeable industry had located within recent years. The records of the Louisiana State Department of Commerce and Industry were scrutinized for leads to such an area, and a half dozen promising sites were selected for more thorough evaluation. It was decided the research design criteria were best met by a small community in southeastern Louisiana. A factory manufacturing wirebound wooden boxes and other wooden products had begun operation here about six years previous to the time of the study. Approximately five hundred persons were employed by the factory.

The farms in the study locality were generally small, averaging 59 acres in 1954. Many of them were in cut-over areas where productivity is low. The chief agricultural enterprises were dairying, cotton, strawberries, and vegetable crops. A few farmers had tung orchards. Pine and hardwood forests are found throughout the region.

The field survey technique was utilized in the implementation of the study. Two questionnaires were developed, one for interviewing plant employees, and one for interviewing open-country residents other than plant employees. The sampling methodology for the employee group was a simple matter of randomly drawing names from an alphabetical list of employees. All together, a 40 per cent sample (204 employees) were interviewed. Probability area sampling was done within the commuting zone to the factory (a 25 mile radius) in order to obtain the open-country sample group.³ Interviews were obtained from 302 open-country families.

With regard to analytical procedures, inferences have been drawn both objectively and subjectively. That is, tentative generalizations have been derived both from simple statistical deductions and from inductive processes relating to personal experience.⁴

The above description, admittedly, is too brief for those who wish to judge for themselves the soundness of the methodological and analytical procedures. They are referred to the more detailed report of the study.⁵

³The sample was drawn by the Statistical Standards Division of the Agricultural Marketing Service, United States Department of Agriculture.

⁴It is realized that economists generally have not subscribed to what is known as the method of biographical induction in sociology. Sociologists of this school hold that numerical symbolism merely measures or describes the course of human conduct and does not explain "why" the conduct occurs. They contend that rich personal experience can be structured into theory and lay the foundation for scientific discoveries in the social sciences, which might not come about otherwise.

⁵Alvin L. Bertrand and Harold W. Osborne, *Rural Industrialization in a Louisiana*

The Impact of Industry on the Labor Force

The impact of industry in a community registers initially upon the available labor force. Ideally, in a low-income rural area, those persons who are unemployed or partially employed would be recruited first. This group would logically include persons having peculiar socio-demographic characteristics of one type or another. In other words, one would expect certain age, sex, race, and like differentiated groups to be disproportionately represented among those available for employment simply because of selective processes operative for labor in rural areas. Generalizations derived from the present study may be stated as follows:

(1) Industrial employers in rural areas are likely to give preference to persons with nonfarm work experience. Of the employees interviewed, the great majority (82 per cent) had worked at some other nonfarm work previous to taking their job at the factory. This finding is corroborated by other studies. For example, Stepp and Plaxico, in their report on a wool-spinning mill that had just begun operation in a low-income rural county in South Carolina, stated that most of the workers had been previously employed in unskilled work in the surrounding area.⁶ Maitland and Wilber found the same pattern in their study of a furniture factory in Chickasaw County, Mississippi.⁷

Two social forces appear to account for this pattern. Persons previously engaged in nonfarm work have already lost their place in agriculture, so to speak. Hence, shift from their previous employment is simply a response motivated by convenience, higher pay, desire for new experience, or related economic and social factors.

The second force, apparently, is a policy followed by recruiting officers for industry. In the plant studied, persons with nonfarm work experience were given preference in employment. This policy was defended on the basis that persons already working off the farm do not require as much training for industrial work and do not have as much of an adjustment problem as newcomers to industrial work.

(2) Rural industrial employers are likely to be selective of the younger age groups in their recruitment of labor. The median age for all workers in the plant studied was 35.7 years. Only one per cent of the employees were 60 years of age or over. This pattern was also apparent in the Mississippi

Community, La. Agr. Exp. Sta. in cooperation with AMS, USDA, Bull. 524 (Baton Rouge: June, 1959).

⁶ James M. Stepp and J. S. Plaxico, *The Labor Supply of a Rural Industry: A Case Study of the McCormick Spinning Mill*, S. C. Agr. Expt. Sta. Bull. 376 (Clemson: July, 1948.)

⁷ Sheridan T. Maitland and George L. Wilber, *Industrialization of Chickasaw County, Mississippi: A Study of Plant Workers*, Miss. Agr. Expt. Sta. in cooperation with AMS, USDA, Bull. 566 (State College, 1958.)

study previously mentioned. The implications of this pattern are far reaching. The advantage to the factory in employing younger persons is seen in its need for workers at or near their physical peak, since much of the work to be done is strenuous. The implication for the community, however, is that the older persons, disproportionately represented in low-income rural communities, are not benefitted by the coming of rural industry. Ostensibly they must farm if they are to be gainfully employed. The alternative to farming is public welfare of one kind or another. Both alternatives have further implications which need serious study.

(3) Rural industries will employ women as well as men. In terms of the high sex ratio and traditional role of women in rural areas, there might be a question regarding their availability for nonfarm work. However, numerous studies have shown female employees in rural industries. In the factory under study about one-fourth (27 per cent) of the employees were women. This finding indicates that females in low-income areas do represent a labor source for industry. It also has an important bearing on questions relating to the impact of industry on agricultural activity and community life.

(4) Some rural industries in the South will employ Negroes as well as whites. In fact, more than half of the workers at the plant studied were nonwhite. This finding is significant because of two considerations: (1) There has been a higher general unemployment among Negroes than whites in southern rural areas. (2) Previous studies have intimated that Negroes in the South have not generally shared in industrial employment outside of cities.⁸ The findings of the present study indicate that rural industrialization may provide for the utilization of this hitherto relatively disadvantaged segment of the population of low-income areas.

The Impact of Industry on Levels of Living

Logically, income would be treated under this heading. However, it is belaboring the obvious to show that persons taking industrial employment improved their income. Suffice it to say that despite the fact that they generally do unskilled work and receive near statutory minimum wages, individuals in low-income rural areas better their incomes with industrial employment.

Hypothetically, a higher money income will mean an improved level of living. However, factors other than income such as education, values, etc., are relevant and sometimes prevent the two from being coincident. A check is necessary, then, to see whether or not families in industrialized communities have actually acquired the goods and services normally asso-

⁸ See: Lewis W. Jones, "The Negro Farmer," *Journal of Negro Education* XXII (Summer, 1953), 330.

ciated with improved levels of living. Seven items currently accepted in studies of levels of living were used in an attempt to determine changes of this nature experienced by the sample population. Interviewees were questioned to determine the presence of each item in their homes in 1950 and in 1957. The items chosen were: electric lights, hot and cold running water, mechanical refrigeration, power washing machine, radio, television, and telephone.

It is readily apparent from the data gathered that the level of living of the families of plant employees rose significantly in the period under study. One-fifth of those interviewed did not have a single one of the above listed items in their homes in 1950, whereas only two per cent did not possess at least one of the items in 1957. The average number of items owned increased from 2.29 in 1950 to 4.81 in 1957, a percentage increase of 110.0 per cent. Maitland and Wilber reported the same pattern among employees interviewed in their Mississippi study.

Interestingly, the interviewees not in the employee group had a larger number of items in their homes in 1950 and 1957. However, the percentage increase in number of items was less for this sample group, 74.9 per cent. In this sense the non-employee sample population may be used as a control group to definitely relate a certain part of the improved level of living of employees to industrial employment.

Two inferences may be drawn from the above findings. In the first place, employees began with lower levels of living because they were recruited mainly from the poorer non-owner classes. Secondly, industrial employment had allowed employees to improve their levels of living to a plane commensurate with or above others in their communities. All in all, the impact of industry is to raise the average level of living.

Impact of Industrialization on Agriculture

One of the prime questions, with regard to industrialization, is what happens to farm operations when the operator or a member of his family accepts off-farm employment. It is pertinent to know if he stops farming altogether, reduces the size of his operations, shifts to a different type of farming, uses substitute labor, and so on. Previous studies, not necessarily done in low-income areas, have reported findings all the way from no change to complete revolutions.⁹ The findings of the present study indicate that industrialization occasions relatively little change in farming endeavors in an area such as the study community. As many as 3 out of

⁹For two representative studies see: Charles E. Allred and Jasper P. Burnett, *Effect of Industrial Development on Agriculture*, Tenn. AES Rur. Res. Ser. Mono. No. 97 (Knoxville, 1939), and W. L. Gibson, "Industrialization and Rural Land Utilization," *The Southern Economic Journal*, XI (April, 1945), 353-359.

5 of the plant employees living on farms reported no change in farm operations after taking their plant job. The 40 per cent of the employees who reported some changes on their farms, said that only minor adjustments of one kind or another were made. Either they decreased their acreages or number of livestock slightly, or substituted one crop for another requiring less constant attention. It is worthy of note that only one individual stopped farming altogether. This finding parallels those of Manny and Nason in their study of a large number of manufacturing plants scattered through several Eastern states.¹⁰

In seeking an explanation for the above patterns, it must be remembered that most farm operations in low-income areas are small and not highly commercialized. Farms in the study community were operated in conjunction with nonfarm activities even before the box factory began operation. Apparently, the factory only provided a more convenient source of off-farm employment than had hitherto been available. Most necessary adjustments had already been made because of previous non-farm work experience. In addition, there were times when the plant did not require a full weeks work, thus providing extra days for farm labor. In this regard it is of interest, as the plant manager pointed out, that many of the farm residents requested work on the night shift so that they might keep up with their farm activities. This fact leads to the conjecture that farming is still more than a way of making a living for many rural people. It is a way of life involving values which are deeply ingrained. This is not a new observation. Daniel Alleger, after making a study of the agricultural activities of industrial workers and retirees in Duval County, Florida, in 1953, concluded that the basic factor in part-time farming is not income, but rather the "felt" advantages of living in the country.¹¹

Impact of Industrialization on Community Life

In terms of social efficiency, the impact of industry on a rural area can best be seen in changes in social institutions, social participation, and other related aspects of community life. It seems logical to expect that most behavioral patterns in rural communities would be affected by an industry employing some 500 people. All interviewees were asked whether or not they felt community schools and churches had improved in the past five years and whether or not they had detected changes in neighborliness, community pride, and the opportunity to get ahead. Al-

¹⁰ T. B. Manny and Wayne C. Nason, *Rural Factory Industries*, U. S. Dept. Agr. Circ. No. 312 (Washington: April, 1934.)

¹¹ Daniel E. Alleger, *Agricultural Activities of Industrial Workers and Retirees: A Survey of Small Agricultural Holdings in an Industrial Area of Florida*, Fla. Agr. Ext. Serv. Bull. 528 (Gainesville, 1953.)

though these questions called for opinions, verbalized responses of interviewees did indicate how they defined the situation. The impact of the factory was "real" to them to this extent.¹² Respondents were also asked to cite the changes in their participation in formal groups in order to round out the picture of change since industrialization. The response to each question may be summarized as follows:

(1) Interviewees were of the firm opinion that schools had improved in the past five years. Approximately 70 per cent of the open-country interviewees and 66 per cent of the employee interviewees expressed this belief, citing evidence such as better buildings, better teachers, and improved curricula.

(2) Approximately half of both sample groups said that community churches had changed for the better in the past five years. However, rather large percentages from both groups could see no difference here. It may be generally concluded that churches had not made the same progress as schools.

(3) The majority (60 per cent) of the interviewees were of the opinion that there was little difference in neighborliness since the coming of the factory. One out of five thought they could see an improvement in this respect. The remainder felt people were not as neighborly, saying everyone was too busy or watched television too much.

(4) Two out of every five interviewees felt that community pride had improved in the past five years. These persons backed their statements with mention of home and yard improvements, better roads, and more facilities. However, half the interviewees did not think there had been any change in community pride. The remainder were undecided.

(5) Interviewees did not participate in a wide variety of formal organizations. Of those who participated in such organizations, most were active in church only. As many as one-fifth of all employees were completely inactive as far as formal organizations were concerned. The majority of the interviewees felt that their social participations had not increased in the past five years. However, 23 per cent of the open-country respondents and 34 per cent of the plant employees interviewed did say that they took part in more organizational activities than five years previously.

(6) Leisure time activities likewise were not affected greatly by industrialization. Some employees (28 per cent) had altered their leisure patterns slightly by watching television and listening to the radio more and participating in active sports less, but this change could well be a function of technology and age as much as industrialization.

¹² This is brought out in W. I. Thomas' concept of "the definition of the situation." See: W. I. Thomas, *The Unadjusted Girl* (Boston: Little, Brown and Co., 1923), p. 42.

Summary Generalizations

In summary, several observations may be made which are pertinent to the impact of industrialization on a low-income rural area. First, the type of industry which will probably have the best chance of success is one employing a relatively large number of persons at the unskilled or semi-skilled level. In this regard, it cannot be expected that many rural industries will pay high wage rates. The lack of skill of workers, their low average education and the traditional wage rates in low-income rural areas all point toward statutory minimum wages. It can be expected also that workers who have had nonfarm work experience, and who are young, will have employment advantages.

In appraising the impact of industry on rural areas, the overall conclusion must be that the effect will be beneficial, but not as far-reaching as might be expected. Indirectly, there will be some change in schools and churches although social participation and leisure patterns will not be affected greatly. The most direct impact will be on the income and levels of living of plant employees.

Finally, a word of caution for community and rural development leaders. Industrialization *per se* is not a pat remedy for rural areas. For greatest success, the industry must be matched to the individual area in terms of the latter's demographic and cultural characteristics. When an industry utilizes the available unemployed and underemployed manpower and is defined as an asset to the community by community members, the ultimate impact of industrialization will be felt.

DISCUSSION: IMPACT OF URBAN-INDUSTRIAL DEVELOPMENT ON AGRICULTURE

JOE A. MARTIN

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We have heard three papers, each one making a contribution to our knowledge about the interrelationship of farm and urban economies. I should like to comment only briefly on the first and last papers, but quite extensively and in detail on the second paper. I do this not because the first and last papers are not worthy of our close attention—they are. Both papers are excellent. I do this because I find very little to disagree with in the first or last papers, but I find some points in the second paper that persuade me to raise some questions with the author.

Professor Sisler has done a painstaking job in testing on a nationwide basis the hypothesis that local urban development is one of the major factors associated with area differences in per capita income of farm peo-

ple. His analysis indicates that within the nation as a whole the income levels in the farm sector bear a direct and positive relationship to the relative level of local nonfarm employment. He finds that the degree of association varied widely between regions. It seems to me that he correctly attributes this lack of uniformity over the whole nation to differences in characteristics of industry and agriculture in various regions. His conclusion is that while local nonfarm development does exert positive effects upon farm income in most areas of the country there is sufficient evidence to support the belief that high levels of farm income can be obtained in some areas without substantial local urbanization.

There remains the question of whether or not the type of industries that may be expected to locate in many of the very low income areas will have sufficient positive effect upon income in those communities to alleviate their problems. The conclusions drawn by Professors Bertrand and Osborne from their study suggests that local industrial development is no cure-all for the low income problem in agriculture.

Professor Tang has brought us an economic examination of the great social malignancy of the 20th century. He endeavors to show in his usual scholarly presentation that economic losses suffered by southern agriculture as a result of racial discrimination will increase as economic development of the region progresses. For analytical purposes Tang uses two well known inequalities as measures of discrimination, namely (1) unequal resource allocation to negro and white farmers, and (2) the historical unequal public expenditure for education of white and negro.

Tang builds his theoretical explanation of how economic losses will increase as development occurs around two assumptions regarding the nature of the labor supply schedule on individual farms. He assumes: (a) that increasing income in agriculture above the subsistence level is accompanied by the classical backward sloping supply curve of family labor, and (b) that the supply curve of family labor on individual farms takes an S-shaped path response to varying levels of resources. Professor Tang then sets forth the hypothesis that "because of the S-shaped path which responses of farm labor to changes in resources may take, market discrimination in agriculture, as measured by unequal resource allocation to Negro and white farmers, may produce different income consequences depending on the stage of the economy's development. In 'early' stages of development when farms typically operate at near subsistence a given difference in the amount of resources on Negro and white farms may produce little or no impact upon per capita income." What he is saying here is that if a majority of the population is existing at subsistence level regardless of resource distribution then clearly inequalities in resource allocation produce no ill effects on per capita income. This would seem to

require no empirical proof because the conclusion follows from a premise which is necessary and certain.

Then Tang goes on to assert that "As the economy advances, typical farms of both races begin to show positive labor input response to increases in farm resources. At that stage, the same amount of race discrimination will noticeably lower the overall per capita income." If we may put his hypothesis in a simple unscholarly manner it would seem to be this; if you deny a man the opportunity for employment when the returns to labor are, say, \$1.00 per hour, the economic loss will be greater than if you denied him the same opportunity with the returns to labor at, say, 50¢ per hour. One will notice that for this proposition to hold it is not necessary for the input of labor to rise or even remain constant in relation to non-labor resources.

Tang's assumptions regarding the nature of the labor supply schedule on individual farms, while consistent with his conclusion, are not necessary adjuncts to his argument. Moreover, both assumptions regarding the supply curve of labor rest on reasons given by Tang which are highly questionable on both theoretical and empirical grounds. The backward sloping supply curve of family labor could no doubt be found on some farms as a short-run phenomenon, but not as a long-run condition for the total supply of family and hired labor. Furthermore it could be a short-run phenomenon for the region as a whole *only* under the condition that the supply of labor could not be expanded. This would appear to be an unreasonable assumption in the light of the large volume of underemployed labor, both white and negro, which yet remains in the group counties to which Tang refers.

Underlying Tang's assumptions regarding the nature of the supply curve of labor on the individual farm is the fact that farms in the area depend primarily upon family labor. He goes so far as to assert that there is an absence of a wage system. While it is true that family labor has and does loom large in the area there is no absence of a wage system and there is no watertight barrier to the movement of labor from farm to farm. Tang cites figures to show that a sizable proportion of the negro labor are employed as hired workers on white farms. It would not seem reasonable to believe that racial discrimination would work against the movement of this segment of the labor force from farm to farm as economic factors justified such transfer. And certainly it would not appear that discrimination would impede the transfer of this hired negro labor toward negro farms when economic factors favor a movement in that direction.

Now, one would be foolish to argue against Professor Tang's hypothesis that the economic cost of racial discrimination will increase—and has increased—as economic development progresses. In fact, it could be said

that this is an axiom rather than simply a hypothesis. But as suggested above, I seriously question the theoretical and empirical basis for his explanation of how that increasing loss occurs.

Finally, I would comment on his analysis concerning the effects of discrimination in the field of public education upon farm income. Here he offered the hypothesis "that race discrimination in the field of public education has little effect on productivity in traditional agriculture, but may have important influences in developed economies where decision-making becomes complex even in agriculture." Again, his logic is not to be debated, but the way that he interpreted this in Piedmont agriculture between 1900 and 1954 is debatable. Tang suggests that differences in education had little effect upon income difference in the area prior to 1940. While I have no knowledge of farm management studies in the counties referred to by Professor Tang made between 1900 and 1940 which show the relationship between income and education, there were several studies made in the South during the 1920's and 30's which indicate a positive relationship existed at that time.¹ There would seem to be little reason to assume that it was different in his study area.

It is true that new production techniques have been brought into Southern Agriculture faster since 1940 than before. But is there reason to believe that innovations prior to 1940 did not affect income distribution as it does now; and further, that about the same relationship between education and adoption of new technology held then as now?

¹Cf. Allred and Sant, "Farm Management in Crockett County" Memo. Univ. of Tenn. Agr. Exp. Sta., 1938, and Dickey, J. A., "Farm Organization and Management in Typical Upland Section of Arkansas," Bul. 235, Ark. Agr. Exp. Sta., 1929.

DISCUSSION: IMPACT OF URBAN-INDUSTRIAL DEVELOPMENT ON AGRICULTURE

BUIS T. INMAN
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Bertrand and Sisler explore the causes of economic growth, the impact of economic growth on agriculture, and causes of unequal growth. Both reach the conclusion that urbanization and industrialization have varied impacts depending on the nature of the people and the agriculture. Tang is concerned, somewhat apart from the impact of urban-industrial development, with economic discrimination against the Negro, and concludes that the extent of discrimination is related to the relative importance of the Negro and the stage of economic development.

The three papers seem in agreement that increase in income to the

individual laborers or their families in an area reflects economic growth. Sisler also quotes Schultz to show that an increase in national income is a condition necessary to economic progress and that this increase must be so distributed that in real terms all segments of the population will be favored. This seems more correctly stated if we shorten it to "An increase in national income is economic progress"—with the provision that all segments of the population benefit. We sometimes overlook this latter point regarding the benefit of increasing national income.

Let's also take a look at the means of bringing about economic growth in low income farm areas. These areas, as recently designated in the Secretary of Agriculture's report, "Development of Agriculture's Human Resources," are labor surplus areas. That is, both farm and nonfarm labor is underemployed in terms of the returns workers with comparable capabilities receive elsewhere. Basically there is a surplus of labor in relation to land and/or capital. To correct this problem for an area, we have three alternatives: (1) to increase the supply of capital through urbanization, industrialization, or more intensive agriculture; (2) remove the surplus labor to areas where it can be utilized in a more productive manner; or (3) a combination of these two. For some reason, many economists tend to ignore the second method. Yet in the postwar period this has been a most effective method. You have only to look at the age distribution in rural areas, and particularly the low income farm areas, to see that there has been a heavy out-migration of the younger and better trained members of the labor force as described by Bertrand. This selective migration creates discrepancies in income since level of income tends to decrease with age and to increase with level of education.

Bertrand and Sisler find that the economic impact in the farming community can be very disappointing if the industry or urban area does not find a way to utilize the labor or raw products of the area. Too often the new sources of employment cannot utilize much of the surplus labor of the area because many of the people are beyond the employable age, they lack education, or for other causes. This situation is well illustrated by one of our cooperative State Agricultural Experiment Station-Agricultural Research Service studies in central Pennsylvania. In this study area, an industry requiring mostly technically trained people located in an underdeveloped area primarily to obtain adequate space. Ted Fuller, who is a leader of the study, reports that most of the workers recruited were not natives of the area. Local people could not qualify for most jobs. Furthermore, these technically trained people chose to live in a town some distance away. As a result, the impact on the local agriculture as well as on the surplus labor will likely be small.

Many of our low income agricultural areas as designated in the Sec-

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retary of Agriculture's report are areas in which commercial agriculture is of minor importance in providing for family income. Such areas as the Appalachians, the Ozarks, the cutover area of the Lake States, and much of the southeastern Piedmont and Coastal Plains, were originally populated more for nonagricultural purposes, as the harvesting of the timber, mining, hunting game, and so forth. Often the peak in economic development occurred with the building of the railroads. At the peak, economic progress appears to have been judged satisfactory. However, for some reason, too often because of depletion of natural resources, economic progress slowed down. Afterwards, more dependence was placed on the limited agricultural resources for a livelihood.

If the economic organization appears to work best near the center of the matrix of economic development, possibly this is because our public efforts are primarily exerted there. If equal public efforts were exerted at the more distant points to provide vocational training, job information, and other influences which would improve the factor allocations, we would likely see more of an equalization of incomes.

Sisler finds for the Plains and West generally that levels of income are not tied to local urbanization. He does not point out that the loss of population from drought and later the combination of uneconomic-sized homesteads have had their effect in much of the West. The impetus for economic growth has harsh characteristics at times.

Tang finds that discrimination against the Negro is in the nature of his more restricted command over resources. This is shown by the fact that the Negro has less land and capital per worker and per farm. I would find it hard to conceive of widespread economic discrimination based on the color of the person when one is in the market purchasing agricultural commodities. The one who could discriminate is also motivated by the desire to maximize profit, and would not be expected to pay more for labor or for commodities because the supplier is white. Hendrix also found in a study of Farmers Home Administration clients that when whites and non-whites were about the same age and had similar qualities and quantities of land and other capital resources, the incomes were on the same level.¹

The Bertrand and Sisler papers point up the fact that agricultural resources as well as industrial opportunities in low income areas merit a thorough analysis before a program to expand the economy is begun. This analysis should provide more assurance that the resources needed for success are there. Many small industries, after they have exhausted their special concessions, no longer find it profitable to remain. The remedy

¹ *Approaches to Income Improvement in Agriculture*, W. E. Hendrix, Production Research Report No. 33, USDA, Aug. 1959.

sometimes suggested, of expanding industry to keep the population in place without consideration of the economic consequences, would seem to have little justification.

More research of the kind reported on in this session is needed for a wider range of conditions to give clues to the results that can be expected from urban-industrial expansion into rural areas.

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MIGRATION IN THE UNITED STATES*

Chairman: Harold Hoffsommer, University of Maryland

ECONOMIC AND SOCIAL IMPLICATIONS OF INTERNAL MIGRATION IN THE UNITED STATES

CONRAD TAEUBER

Bureau of the Census

WITHIN the 3.6 million square miles of the United States, people are free to move whenever and as often as they wish. This freedom of movement has been essential to the economic and social development of the Nation, for migration has been a major means whereby people responded to the frequent and marked differentials in economic opportunities in the various parts of the country. The rapid growth of the country would have been impossible if each local area, State, or region had been dependent only on the natural increase of its own people. Conversely, the problems for some areas would have been very difficult if each local area, State, or region had been required to provide economic opportunities for all of its own population growth. Depressed areas reflect the frictions in the process of adjustment of population to the resources base despite the freedom to move. They indicate also what would have been a much more widespread phenomenon had migration been restricted through legal or administrative means.

A process based on millions of individual decisions and on millions of actions resulting from these decisions necessarily involves a large variety of individual results. Differences in the level of specific abilities, differences in training, in the mobility associated with various occupations, and in the degree of completeness and accuracy of the information on which actions are taken are all involved. From some points of view the entire process has been a very inefficient one, if the over-all allocation of human resources is taken as the basic criterion. Nevertheless it has been a part of the whole process of industrial development. Migration, occupational mobility, social mobility and industrial growth were not identical processes, but they were closely associated.

The significance of a migration for the individual is not to be measured only in terms of the distance traveled. Some short distance migrations may involve a significant change in the social setting in which the individual operates. Some long distance migrations, particularly those of certain business and professional groups, may involve only minor changes in the individual's status so far as the group with which he works is concerned.

* Joint meeting with Rural Sociological Society.

Natural increase and economic opportunities in the area of birth have tended to be related inversely to each other throughout most of our history. In the colonial period and long thereafter young people could carve out farms in adjacent areas or move onward to new areas where land was available. But even then cities were growing rapidly, supported in part by migration from overseas as well as migration from the rural areas in this country. Migration was an essential part of expansion. For some persons the movement to another location could be made without any significant changes in the mode of life. Increasingly, however, the search for a better job, a higher income, or a more desirable life involved movement from agricultural to other occupations and from farms or villages to cities.

The expansion of the settled areas and the growth of cities were the products of internal migration of natives as well as of immigrants, and also of the immigration from foreign countries and the relatively high rates of natural increase which occurred throughout much of our history. Some 20 years ago, Rupert Vance observed that differential reproduction alone would more completely alter the distribution of the population in a generation than is normally done by migration.¹ But this redistribution would have resulted in an inefficient pattern of resources use such as that in the rural problem areas of the 1930's when out-migration was sharply reduced.

Migration leads to a redistribution of the population, altered patterns of marriage and family formation, and changes in the levels of fertility and mortality. It often involves a change in the mode of living, in occupations, and in basic attitudes. The consequences of any given move may not be successful. In fact, if all that were desired were a simple change in the numbers of people in any given area, the pattern of free migration would prove to be very inefficient. Goals in general and in specific migrations differ, for each individual is free to choose his own goals or to select from among his goals those which are best achieved through migration. The conditions that represent opportunity or improvement to some are unacceptable to others. The level of the attainable differs from individual to individual, family to family, and group to group. In individual cases the move may lead to adjustment or to failure, or to a life that is less desirable than the one that was anticipated. There may be return movements, or movements on to other locations, and there are individuals who are constantly on the move in search of still unfound opportunities, or because they are engaged in occupations which require such mobility. Typically there are many currents and cross currents and a net gain or loss may involve a total number of migrations that is many

¹ Rupert B. Vance, *Research Memorandum on Population Redistribution Within the United States*, SSRC Bulletin 42 (New York 1938), p. 32.

times the number involved in the net. The factors involved are far more intricate than those involved in the simple concepts of "push" and "pull."

Since society and the economy are dynamic, the readjustments achieved through migration are never completed. Firms, industries, and regional economies may grow or decline. Out-migration may be as essential to the health of an industrial area as to an agricultural one. So long as there is differential fertility, economic development, and equality of opportunity there must be internal movement. Attempts have been made to reduce some of the obstacles, as through vocational training to facilitate the finding of jobs in other locations, the provision of information concerning job opportunities, and occasionally direct assistance in moving to a new location. But basically the economy has relied on the choices of individuals in search of better opportunities as a means of bringing people to the locations where they can take advantage of these superior opportunities. Although it is normally assumed that the motivations are primarily economic, in the sense of real or money incomes, the adjective "economic" was deliberately omitted from the noun "opportunities," because opportunity often is defined in terms which are not readily expressed in monetary units.

Patterns of Migration

Four major streams of internal migration can be identified, though in each case there has been a substantial movement in the opposite direction, and there have been many lesser currents and cross currents. The westward movement across the United States dominated the scene for more than a century, and it still continues with the large scale migrations into California year after year. In the present century there has been a large scale movement from South to North, involving many whites and Negroes. The movement from rural areas to cities has continued from colonial times—it is also heavily involved in the movement from East to West and that from South to North. The shift of population from the large cities to their suburban areas, which has recently been the subject of much discussion, is a continuation of a movement that reflects the expansion of cities beyond their corporate boundaries.

The readiness to move and the prevalence of movements seem to have characterized Americans throughout their history. For a hundred years the census has included a question on the State of birth. The resultant series of migration figures extend over a span of years in which the total number of persons born and living in the United States increased from nearly 18 million to 140 million. Throughout this period, approximately one in each four persons was found to be living in a State other than the one in which he was born. Migration as measured by the difference be-

tween place of residence and place of birth had kept pace with population growth.

The currents and cross currents and the preferred routes of movement are quite apparent in the data on State of birth. For each person represented in the statistics as a net gain or loss by migration, there were usually several persons who had moved. For example, in 1950, there were 5.8 million persons who had been born east of the Mississippi River, but were then living west of it. But the same census showed that 2.7 million persons who had been born west of the River were then living east of it. Similarly, 5.0 million southern-born persons reported residence in the North, while 3.1 million northern-born persons were living in the South.

There were also preferred routes that carried migrants from one area primarily to certain other areas. A migrant from rural Georgia going north was more likely to move along the Atlantic Coast, whereas one from rural Alabama was more likely to end his journey in one of the midwestern cities.

There has been a considerable persistence of patterns of migration. Ten States have reported losses through migration at each census since 1870, including three New England States, Pennsylvania, and six southern States. Since 1900 they have been joined by five others, including three in the Midwest and two in the South. Twelve States have had gains by migration in every decade since 1870: Florida, Michigan, Texas, and nine western States. After 1900 they were joined by Connecticut and New Jersey. Although the vast majority of the people born in a State continue to live there, some States have been making significant contributions of manpower to other States over a long period of time. Migration has generally been from areas of lower to areas of greater economic opportunity. It is also true, of course, that many areas might have benefited had there been more out-migration.

In a recent survey of population redistribution and economic growth in the United States from 1870 to 1950, Kuznets and Thomas attempted to secure measures of the relationships. Migration to and from States was compared for two periods, 1870 to 1910, and 1910 to 1950. The economic variable used was service income per worker, classified as high, medium, and low. Despite some exceptional cases, in both periods of comparison the States with high service incomes tended to receive migrants, while those with low incomes tended to lose migrants. In both periods most of the States with medium incomes lost native white migrants.²

² Simon Kuznets and Dorothy S. Thomas, "Internal Migration and Economic Growth," in *Selected Studies of Migration Since World War II*, Milbank Memorial Fund, 1958, pp. 196-211.

The Movement from Farms

A major part of internal migration in the United States has been the movement from farms to villages, cities, and suburban areas. Much of the movement measured in the statistics on State of birth and State of residence, and much of the movement within States, was a movement from farm to city. During the 35 years from 1920 to 1955 the net migration from farms amounted to 24 million persons. This is somewhat more than the total number of immigrants who arrived in the United States during the 40 years from 1891 to 1930. As was true of the immigrants, a large proportion of the migrants from farms were young people ready to enter the labor market at their new locations. The receiving areas did not need to incur the costs of rearing and training this part of their labor force. And often the migration involved some transfer of capital as well, for the laws of inheritance tend to favor equal distribution of property among the heirs.

During the 1920's, the net migration amounted to 6.3 million persons. During the 1930's, the total for the decade was 3.8 million. In two years of that period there was a net movement to farms. During the 1940's the net movement from farms amounted to 9.5 million persons, approximately equal to one-third of the population living on farms at the beginning of the decade. Although the farm population in 1950 was smaller than that in 1940, the average net migration since 1950 has continued at about 1 million per year—the difference between 1.5 million persons leaving farms and 0.5 million moving to farms.

This movement was so large that the farm population declined from a peak of about 32 million in the years before World War I to about 21 million in 1958.

Stating the facts in terms of millions of persons and in terms of the differences between numbers of persons moving in one direction and numbers going in the other is to state only one aspect of the total facts. This way of putting it tends to neglect the millions of individual decisions that are involved. There were the young people who completed their early education in a rural area and moved to a city for further education or entrance into the labor market. There were also the young families which moved from farms that no longer provided an adequate living; there was the displacement of unskilled workers by the rapidly developing agricultural technology and the dispersion of members of a family to all parts of the country. There were many persons who found it difficult to put down roots in unfamiliar surroundings, and there were movements that involved a transfer from rural to urban slums. For many migrants the shift to other opportunities proceeded smoothly. For others there

were difficulties such as those which John Steinbeck described graphically in his *Grapes of Wrath* in the 1930's.

Two facts are overwhelmingly clear. Without the manpower that became available through the migrations from farms—as well as the shift out of agriculture which involved no change of location—industry could not have grown as it did, unless immigrant manpower from other countries had been utilized. And, if these millions of persons had not left the farm, and if many others who continued to live on farms had not shifted into nonagricultural occupations, our agriculture today would have many similarities to that of densely settled agrarian areas in other parts of the world. If the farm population had grown to more than double its present size and were still growing rapidly, improvements in agricultural technology would have been very significantly slowed down.

Farm families have always been more than large enough to replace the farm population. An estimate as of 1950 showed that 40 percent of the young men reaching working age during the 1950's could be spared from the rural farm population without reducing the number of men of working age on farms. Any reduction in the number of farms or in the requirements for men of working age on farms would obviously increase the number of men who would be surplus in this sense.³ However one evaluates our current farm problems, it is clear that unless the national economy had been prepared to take a large proportion of the young workers who were maturing on farms, a very difficult set of farm problems would have emerged. Whatever the attitudes toward this "flight from the land," it is apparent that this shift in the residential and occupational pattern of our population was a condition of economic progress.

Earl Heady and Joseph Ackerman recently asserted that "... the long run solution (to our farm problem) lies in fewer labor resources in agriculture and a smaller number of farms ..." and that "... perhaps, most of all, we should look upon the problem as one of longer term adjustment, of encouraging more of our farm youth to follow other pursuits."⁴ In emphasizing the desirability of shifting additional human resources out of agriculture, they were simply stating what had been stated again and again in the last 30 years. They pointed out that in spite of the fact that large numbers of workers have become available for employment elsewhere in the economy, there are still many farm families with a lower standard of living than is consistent with an economy that is rapidly

³ Gladys K. Bowles, and Conrad Taeuber, *Rural-Farm Males Entering and Leaving Working Ages, 1940-1950 and 1950-1960*. Series Census-AMS (P-27) No. 22, Aug. 1956, U. S. Dept. of Commerce and U.S. Dept. of Agriculture.

⁴ Earl Heady and Joseph Ackerman, "Farm Adjustment Problems: Their Cause and Nature and Their Importance to Sociologists," in *Rural Sociology in a Changing Economy*, published by the University of Illinois College of Agriculture for the North Central Regional Rural Sociology Committee, Urbana, Illinois, 1959, p. 8.

growing wealthy. They concluded that "... the basic solution is obvious: Some resources must be transferred out of agriculture if prices are to be used in guiding production and if income per farm is to be sufficiently high."⁵

Heady and Ackerman expressed the view of many others when they said that the transfer of workers out of agriculture to other sectors of the economy must continue. Undoubtedly the great majority of those who moved improved their own situation, and also contributed to the increase of the national product. But in view of the fact that in 1954 the least productive three-fifths of the commercial farms accounted for only about one-fifth of the total farm sales, it is pertinent to ask whether the migration came in large measure from areas where pressure of population on resources was greatest and what effect the migration had on those who remained in agriculture.

There are two views about the areas which most need out-migration. One view might be that the most immediate problem is that of creating a situation in which those who remain on the farm can so enlarge their operations that they can take advantage of the new technology and the resulting economies of scale. On that basis a relatively large out-migration from the farming areas which could most readily adopt new techniques and equipment would be most desirable. Another view stresses the welfare of the farm people who might migrate and those who remain on farms. According to this view, that movement is to be favored which reduces the numbers seeking livelihoods in agriculture in the low income farming areas.

Both the circumstances of migration and the equipment which migrants take to urban areas differ for the prosperous and the low income farming areas. Insofar as the better farming areas provide better educational and other facilities, they give their young people greater opportunities for adapting to a different mode of life. In contrast, the low income areas often have meager educational and other facilities.

The Department of Agriculture report on *Net Migration from the Rural-Farm Population, 1940-1950*, shows that during the 1940's as during the 1930's, there was a somewhat higher rate of migration from low income farming areas than from those classified as medium and high income areas. The differences were not large, and in both decades the rates of out-migration were lowest for a group of areas classified as moderate low income farming areas. On the whole it appears that the migrations since 1930 have not differentiated significantly among the resource areas.⁶

⁵ Ibid p. 7.

⁶ *Net Migration from the Rural-Farm Population, 1940-1950*, U. S. Dept. of Agr. Stat. Bull. No. 176, June 1956, p. 13.

NET MIGRATION OF RURAL FARM POPULATION FROM FARMING
AREAS CLASSIFIED BY INCOME

Area	Rate of net migration ^a	
	1930-40	1940-50
United States total	-12.7	-30.9
Medium and high income farming areas	-13.2	-28.0
Low income farming areas	-12.5	-33.8
Moderate low income farming areas	- 8.3	-27.8
Substantial low income farming areas	-13.9	-34.9
Serious low income farming areas	-14.2	-36.9

^a Expressed as a percentage of farm population alive at both beginning and end of decade.

Migration from agriculture has always been highly selective for youth. More than half the farm young people who were 10-19 years old in 1940 left the farms during the decade. Among those who were 20-24 years old at the beginning of the decade, nearly 40 percent migrated during the next 10 years. But among persons who were 30-49 years old at the beginning of the decade, the rates of out-migration for 5-year age groups were between 15 and 19 percent.

One result of the relatively greater out-migration of young men is that farming became increasingly an older man's occupation. A comparison of the Census of Agriculture reports for 1890 and 1954 highlights the changes that have occurred. In those two years the number of farms reported in the census was about the same, 4.8 million. In 1890, 27 percent of the farm operators were under 34 years old, in 1954 only 15 percent were in this age bracket. On the other hand, in 1890, 26 percent of the farm operators were 55 years old or over, and in 1954, 37 percent were in this age bracket.

Forty percent of the farms whose operators were 65 years or older in 1954 were not classified as commercial farms; for operators aged 35 to 64, the percentage was 30. Whether these non-commercial farms continue or not may be of little significance for agricultural adjustment. The problems associated with the low incomes on non-commercial farms are seldom susceptible to direct agricultural measures. But the nearly 500,000 commercial farms operated by persons 65 and over probably include a considerable number of establishments that will not continue after the current operator ceases to be active.

The large scale migration away from farms in the recent past indicates far-reaching changes in agricultural manpower in the near future. There are not now sufficient younger farm operators to replace those in the middle and upper ages. In 1954, there were 460,000 farm operators 25 to 34 years old on commercial farms, but 779,000 in the next 10-year age

span, 35-44. These in turn were fewer than the 810,000 in the age bracket 45-54. With normal mortality and the low likelihood that persons will enter farming after reaching age 35, there will probably be a continued reduction in the number of farms, even if there were no further migration away from farms by men who were over 35 years old in 1950.

Effects of Migration in Rural Areas

The literature on internal migration contains much discussion of the negative effects of migration out of an area on the quality of the population that remains. It is clear that migration is largely a young people's activity, and that where there is heavy out-migration the remaining population is likely to consist of unduly large proportions of the very young and the old. There have been cases in which migration removed a disproportionately large number of men, leaving the women and children to carry on in the old locations. That such developments have created and continue to create many problems for community organizations is clear. There is evidence that young people who have completed high school tend to leave farms in relatively large numbers and that students with relatively high grades are most likely to leave. But what may be concluded from these findings is far from clear. Whether migration selects the most able, or the least able, or both, or simply a cross-section from the full range of abilities remains a question on which no clear answer can be given. Although this is a matter of concern to all persons who are dealing with problems of community organization and with the development of agricultural programs, there is no adequate body of information on this point.

The burden of rearing and training young people to make their contributions elsewhere is often a serious one. Nearly one-half the counties in the United States lost population between 1940 and 1950, and there were others in which out-migration was large but did not result in a population decline. With a declining population base, the problems of providing educational and other facilities become increasingly difficult. The dilemma that confronts such areas has been recognized in the Rural Development Program with its emphasis on educational programs. Such programs can assist some of the young people in finding satisfactory adjustments elsewhere, and enable those who remain to take advantage of the opportunities which modern technical developments make possible.

Migrants in the Cities

Whenever a large number of migrants arrived in a city under circumstances which placed them in the less desirable occupations and in the less desirable housing, they met with community hostility. So long as

they were socially visible by dress, speech, lack of education, lack of occupational skills, or otherwise, they were recognized as problems, and indeed they created many problems for the community agencies in what to them was a strange environment. Often they were referred to as Wops, Hunkies, Micks, Hillbillies, Okies, and others with similar connotations. But the distinctions implicit in these terms lessened as the migrant group adjusted to the new environment, shed some of its distinguishing characteristics, and moved upward in the economic scale. This was especially true for the children of migrants, for they grew up in the cities and attended urban schools. The process of assimilation was often slow and it was sometimes harsh. It is not yet fully completed for many groups. But it has been repeated often enough under sufficiently different conditions to warrant the presumption that recent migrants from the economically less advanced rural areas into industrial cities will be assimilated into the dominant urban culture.

One minority group that has been heavily involved in these migrations, especially in the last 20 years, has the added disadvantage of a high degree of social visibility because of skin color. The economic and social disadvantages which many of the rural migrants to cities bring with them are intensified for Negroes by the fact that they are readily identified even after major improvements have occurred in occupational status and in income. As a result of the large-scale migrations, the problems associated with the relations of population groups identified as White and Negro have spread from the South to the North and West.

By 1956, two-thirds of the nonwhite population 14 years old or over were living in urban areas, and only 14 percent in rural-farm areas. Because of the heavy migration, five northern States—Illinois, Michigan, New York, Ohio, and Pennsylvania—accounted for half of the national increase in the number of Negroes between 1910 and 1950. Another fifth was absorbed in California, Florida, and Texas. The migration was so large that the five southern States with the largest Negro population accounted for little more than 3 percent of the total national increase in the Negro population.

The migration of Negroes out of the South has been predominantly a migration to the larger cities. In 1950, 89 percent of the Negroes living in the Northeast lived in urbanized areas, i.e., cities of 50,000 or over and their closely built-up adjacent areas. Half the total lived in the urbanized areas with 3 million persons or more. Similarly, in the North Central and the western States at least four-fifths of the resident Negroes lived in urbanized areas. Only in the South do more than half the Negroes live in rural areas. In the northern and western cities the majority of the Negroes live in the central cities rather than in the suburban areas. The

migration from the rural South to the North and West has been in very large part a one-way migration with less movement in the opposite direction than might have been expected from observation of other migration streams.⁷

Mobility of the Population

The migration from farms, or that from rural to urban areas, has attracted special attention because it often involves significant adjustments for the individuals and the areas concerned. But these movements are only part of the considerable amount of movement that occurs. The figures for 1935-1940 may be used to illustrate the relative volumes of movement. During that 5-year period, the number of migrants to urban areas was reported as a little more than 8 million. Of these, about 5 million came from other urban places, 2 million from rural-nonfarm residences, and only 1 million from rural-farm locations. One-third of the persons who moved to cities of 100,000 or more had come from other cities in this size class. The results were not much different for smaller cities, but more than half the persons who moved to rural-farm locations came from other farms.

Approximately one-fifth of the population changes its residence in the course of a year. While the great majority go only short distances, and are replaced by others moving in, the disruption of local ties which is involved has been felt by many local groups. Workers with community and other organizations have frequently commented on the problems that the high level of mobility creates for the effectiveness of their organizations. Some of the mobile groups in the population may in turn develop an ease of fitting into new situations which is not always matched by the readiness of the less mobile elements to receive them. Others, particularly rural migrants, may lose local ties in the areas of origin and fail to participate in the neighborhood or community activities in the areas into which they move. Studies of local participation of migrants from rural to urban areas stress this tendency, though they do not always add that many of the migrants had not been active in local organizations in their former areas of residence.

There is much speculation about the migration of older persons, especially since Social Security payments are available without reference to residence. The attractions of the favorable climate of some of the Gulf Coast, the Southwestern and the West Coast areas, do exert some pull, and there are centers where older persons tend to congregate. But all of

⁷ See Irene B. Taeuber, "Migration, Mobility, and the Assimilation of the Negro," presented at the 1958 Annual Conference of the National Urban League, Omaha, Nebraska; reproduced in *Population Bulletin*, Volume XIV (7), November 1958.

the available evidence indicates that the vast majority of older persons remain in the localities in which they were living before retirement. Persons in the age group 65 and over tend to have migration rates (for interstate migration) only about a third as high as those for the most mobile age group (those 15 to 24 years old), and have rates below those for the age group 45 to 64. Social Security records on changes of address indicate that only a small fraction of all beneficiaries are involved, and that many changes of address are only temporary. Although there may be an increase in the number of older persons who change residence, the major part of the rapidly increasing number of these persons will continue to be distributed throughout the entire country in much the same pattern as the total population rather than being increasingly concentrated in a relatively few areas.

Some Effects

The continuing movement from farms has resulted in a shift from a predominantly rural to a predominantly urban, and metropolitan, population. By 1920 the urban population was in the majority. That majority has continued to increase. By 1950 the proportion urban had grown to three-fifths, but then a new definition was introduced to take into account the rapid growth of the urban population outside the corporate limits of cities. On the new basis, the proportion urban was nearly two-thirds. The 1960 Census will presumably show that the proportion urban has again increased significantly.

Recognizing what a recent report calls the "Exploding Metropolis," Census statistics are presented not only for the political entities known as cities, but also for groupings designated as Standard Metropolitan Statistical Areas. Such an area is designated for each city of 50,000 and over which is not within the SMSA of a larger city. It includes the county in which the city is located, plus any adjoining counties that meet certain tests of economic integration with the central city.

There were 168 SMSA's in 1950, and they included nearly three-fifths of the total population. Four-fifths of the people in the Northeastern States lived in these metropolitan areas; even in the South the proportion was three-eighths. Approximately three-fourths of the entire growth of the national population between 1900 and 1950 occurred in the SMSA's that were recognized in 1950. From 1950 to 1956, 84 percent of the total national growth occurred in these areas. The 1960 Census will recognize more than 200 SMSA's, and will undoubtedly show that they have continued to account for almost the entire growth of the national population.

Increasingly, the population of the Nation is concentrated in a relatively small number of areas. The recognition of this fact will require

far-reaching changes in many of our modes of action, including some in the political realm. In the Congress, as well as in State Legislatures, and in many governmental activities, problems that are created by the shift in the balance of population from rural to metropolitan are clearly evident, and it is difficult to adapt political structures that were designed under one set of circumstances to another.

The continual interchange of population between rural and urban areas, and the spread of industrial plants into areas that were formerly rural, pose new situations for the agricultural agencies. The decrease in the number of farms and of the farm population has created significant problems of organization for agencies that are accustomed to functioning on a county basis. The movement of industry into formerly agricultural areas, and the consequent shift of emphasis from full-time to a part-time agriculture on the part of many farm operators raise questions of basic policy for the Extension Service and other agencies. The term "part-time farming" in itself represents an agricultural focus; much of what is included under this term represents only a small part of the economic activities of the people concerned. The Extension Services in a number of States are giving major consideration to the new situation and a variety of approaches is being worked out.

As a result of the continued intermingling of rural and urban people, the distinctions involved in the dichotomy, rural and urban, are becoming increasingly blurred. The classification into rural and urban was a convenient one. It continued to be used long after students had pointed out that the phenomenon under observation was best described as a continuum and that any two- or three-fold classification was an oversimplification. There appears to be some danger now that the analysts, as well as the less critical users of these concepts, are sometimes misled by the very simplicity of the distinctions. The time may have come when a careful restudy of the situation is needed. The outcome might be a redefinition of the categories that are used, or the establishment of a new set that will be consistent with the pattern of life that is developing. This is not something to be undertaken lightly; it involves large areas of public action, legislation, and the distribution of public funds, and much work being done in the Colleges of Agriculture, and other research agencies.

The fact that Americans exercise their freedom to move has been an important factor in developing national homogeneity. The migrants carry with them the cultural traits of the areas from which they come, and, in turn, influence the culture of the areas to which they go. No major area in the entire country has escaped the impact of these movements. There is hardly a remote community that doesn't have continuing

contacts with other parts of the country. Word of mouth continues to be one of the most significant means of communication. Migrants serve as a channel of communication through visits, letters, and active recruiting from among friends or relatives who remained behind.

Given the dispersion of its native sons and daughters that is characteristic of nearly every rural community, and the media of mass communication, there has been little opportunity for any area, even a remote one, to fail to participate in the current economic and social developments. The growing similarity among the regions and groups within the country may appear as dull uniformity to an unsympathetic observer. Another aspect of this situation is that we have had little occasion to develop picturesque cultural islands that have been by-passed by cultural and technological developments. The rapid diffusion of values and attitudes and of styles of life has been significantly facilitated by the continuing interchange of population which we call internal migration.

The population of the United States is currently increasing at a relatively rapid rate. Some differences in fertility remain, with rural populations having higher fertility than urban populations and the rates for farm people generally exceeding those for nonfarm people. There is no longer any basis for the concern expressed some years ago that the cities will decline unless they can be assured of a continuing stream of migrants from rural population surpluses.

The national population has become predominantly industrialized and urban. The back-to-the-land movement of the early 1930's was at best a feeble and ineffective means of dealing with the problems generated by the economic depression. Developments since that time have made this an insignificant element in dealing with any economic difficulties that may develop. Every industrial setback, even a prolonged strike, may carry a few migrants back to an area from which they recently came, but the vast majority of migrants from rural to urban areas have no such "insurance" against economic reverses.

There will continue to be a need for high levels of mobility in the population if the economy is to function at the levels of which it is capable. Rural-urban migrations will contribute, but they may well become less and less significant in the total pattern of internal migration. The focus of research attention is already shifting as internal movements become primarily those of exchanges of populations between areas of similar levels of economic and social development. There is no reason to assume that this shift will not continue.

THE IMPLICATIONS OF RURAL YOUTH MIGRATION AND OCCUPATIONAL MOBILITY FOR AGRICULTURE

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The Transition Years

THE transition years from youth to adulthood are a significant period in the life of American youth. There is one major event in this phase of a youth's life which has the almost unreserved stamp of society's concern. It is a time of leaving home. Establishing an household separate from the parental family, and assuming the responsibilities of an adult are highly symbolic events in the eyes of youth as well as adults.

In the case of the rural community, the period has been of traditional concern. The vast array of interests in agriculture and rural life focus a great amount of attention on rural youth. The attention is a motley mixture of honest social and economic concern, scientific curiosity, Yankee piety, and sentimental dream weaving.

Economists attach themselves to this phase of human development and apply their equilibrium model. To them the point seems to be one of matching the labor-force population with opportunity for productive employment.

Sociologists look at this equilibrium model and wonder why people don't behave in a way to wholly fulfill it. They see a kind of inertia in society which makes the assumption of a reasonably strong general response to shifts on either side of the equation appear at best to be a sort of creeping response in times other than war, gold discovery, or other dramatic events. While sociologists make significant contributions to understanding the forces aiding and abetting the fulfillment of the equilibrium model, they are often hardpressed to improve on its classic assumptions as a significant point of reference.

The Policy Question

Public policy must continuously search for ways of maximizing the utility of human and natural resources within a given normative framework.¹ Human and natural resource development and intelligent use depend to a large degree upon the extent to which adjustments in modes of living and making a living can be accomplished with a minimum of personal and social disorganization. The rural community in general and the farming industry in particular provide an opportune cluster of problems around which this basic policy question can be analyzed.

¹For an excellent exposition of this point of view the author recommends: *Turning the Searchlight on Farm Policy*, The Farm Foundation, Chicago, 1952.

There appears to be consensus among agricultural economists that if commercial farming is to realize the full returns on advancement in science, technology, and improved management practices, it will become and indeed has become less capable of absorbing large numbers of people in its labor force. The small, inefficient farm may well be eliminated from the commercial farm policy arena. Commercial farming will become considered less as an out for people facing economic difficulty. There will be greatly reduced opportunity for young people with farm background and experience to enter commercial farming. Lags in adjustment to these changes have created and will continue to create a surplus population in the nation's farming industry and therefore hinder attainment of high level economic productivity and level of living.²

There is not wide general consensus that the position outlined above is valid. The argument is usually based on a philosophy best termed agricultural romanticism. The content of the argument emphasizes "flight from the land," "the rural decline," "the fundamental character of the farming industry," "the man, land, God covenant," the "family farm," and the not too clearly stated position that all people engaged in farming, regardless of scale of operations or commitment to the farming vocation, may be considered as one body.³

Here, then, is one way of viewing the inevitable policy dilemma. There is always the irrational and the rational to be reconciled. When rural youth are the subject of policy discussion it becomes extremely difficult to obtain critical judgment and evaluation. Critics of public policy need to remember this.

The Research Question

It would seem that an attempt to study the transition period with a view toward discerning commonalities and variation among selected features of socio-economic import would make a useful contribution not only to the general understanding of the growing-up process, but also there would be available a factual base to which public and private interests might well turn in attempting to formulate and reformulate programs to fulfill the policy obligation outlined earlier in the paper.

With regard to the rural youth population, it must be accepted that a major segment will move to urban areas. There won't be a farm for every

² *Opportunities and Limitations for Employment From People Within and Outside of Farming*, working papers for Seminar on Agricultural Resource Adjustments, Division of Agricultural Economic Program, Federal Extension Service, U.S.D.A.

³ See *The Family Farm*, Rept. of Subcom. on Family Farms, House Com. on Agr., U. S. Cong. (U. S. Govt. Print. Off., Washington, Aug. 1, 1956) for an excellent summary statement on problems and outlook for the family farm.

farm boy. But some will stay. Is there selectivity here? How does a farm-reared young man make out in industry as compared to his rural nonfarm counterpart? What kind of a life are rural young people making for themselves as they enter the adult world?

In the most narrowly conceived sense the research question centers on the impact of place of residence in childhood and youth on the several processes of socialization during the transition years.

This general orientation led to the formulation of a research program at the Pennsylvania Agricultural Experiment Station in 1947. The objective of the program was to discover the extent to which differentials in personal and social characteristics of rural young people functioned as aids and obstacles to realizing certain goals upon which society places value.⁴

Source of Data

The sample selected in 1947 consisted of members of sophomore classes from 74 rural high schools in Pennsylvania. The number of youth who were administered a detailed questionnaire and personality adjustment inventory at that time was 2,810.⁵

Schools were selected from the state's fourth-class school district population. Because of this no school was situated in a center of more than 2,500 persons.

Areas having a heavier concentration of farm population contributed relatively more schools to the sample. This was considered wise at the time because an adequate number of cases with farm background was desired for detailed analysis. Reasonably random geographic distribution was obtained by numbering school districts on a map in a manner that interval selection would yield a minimum of contiguous districts. Forty-seven of the state's 67 counties were represented.

The sophomore class was chosen as the age group best suited for the problem in that the effect of withdrawal from school would be at a minimum.

Intelligence Quotient scores were copied from school records.

A family status rating was accomplished by having a selection of local community leaders rate each young person's family on the following attributes:

1. General standing in the community
2. Success in occupation
3. Participation in community affairs

⁴Since July 1956 the project has been carried on in cooperation with the Farm Population and Rural Life Branch of the Agricultural Marketing Service, U.S.D.A.

⁵California Test of Personality-Secondary, Form A, California Test Bureau, Los Angeles.

From 1947 until 1957 the major effort was one of maintaining contact with members of the sample. At least a yearly address check was made. This proved to be approximately 60 per cent successful. The plan called for interviewing each person in the sample in 1957. Address rosters were completed by visiting relatives and friends in the 1947 communities of residence.

In 1957 an elaborate schedule form was designed for purposes of reconstructing the social and spatial mobility history of each case. In addition a comprehensive survey was made of general social-economic status as well as opinions and judgements concerning present accomplishments and general outlook for the future.

By 1957 several hundred cases were living outside Pennsylvania. A commercial survey research organization was engaged to interview these cases.⁶

The 1957 interviewing produced completed schedules for 2,344 of the original 2,810 cases. Statistical tests showed no significant bias as a result of the loss. The 1957 sample was composed of 45 per cent males and 55 per cent females.

This paper will make use of only the male segment of the sample with the farm-reared male being the point of emphasis. There are 1,042 cases for which information is complete over the ten-year period. Two hundred and seventy were farm reared. One hundred and ninety-eight came from open-country nonfarm backgrounds, while five hundred and seventy-four grew up in towns and villages of less than 2,500 population.

A Selection of Qualitative Attributes

Before moving into an analysis of migration and occupational choice it seems wise to look for a moment at the extent to which there was significant qualitative variation within the male sample which could be in some measure accounted for by place of residence of childhood and youth. In other words, does growing up on a farm, in the country but not on a farm, or in a small town account for any significant variation in certain measures upon which society places differential value?

The intelligence quotient is widely used as a qualitative measure. While its misuse and misinterpretation is perhaps all too frequent, it remains as a handy device to differentiate mental ability. The mean intelligence quotient score for all the males was 103 with farm males averaging 102 and open-country nonfarm and village males each averaging 103.

The California test of personality referred to earlier was designed to test the extent to which a young person sees himself as being self reliant, as being an object of worth, and a person with a sense of freedom. It also considered the extent to which a person was free from abnormal frustra-

⁶ Crossley Research Associates, New York.

tion in home, community, and school relationships. A perfect score on the test was 180. The mean score for the male sample was 136 with the farm segment averaging 134, the open-country nonfarm 135, and the village group, 136.

Apparently the breakdown of traditional barriers to extensive interaction, coupled with advances in mass communication, equalized what at least was thought to be differential opportunity for social and intellectual development because of the rural ecological pattern. In the aggregate it might be concluded that the farm male was no more nor apparently no less developed intellectually and personally than his rural nonfarm counterpart. This observation takes on added significance when it is remembered that the content of intelligence and personality inventories is very likely to be underrepresented in symbolism and ideas associated with rural life and agriculture.

In 1947 an attempt was made to discern any differences among the three residence categories with regards to attitudes of liberalism and conservatism concerning a selection of behaviors ordinarily employed in the home, school, and community's role as socialization agents of young people. Examples of behaviors investigated were: dating, failure in school, ways young people spend their money, and working on Sunday. Fourteen types of behavior were studied. The general conclusion was that farm boys were more likely to hold a conservative point of view than those in the village with open-country nonfarm youth occupying a middle position.⁷

The group as a whole, however, displayed rather marked conservatism. This squares well with other studies of adolescents which generally concluded that they are quite likely to possess a highly moral and conservative system of beliefs.

Farm-reared youth were more likely to be interested in vocational courses in high school, village youth preferred the sciences and the open-country nonfarm group were more interested in the liberal arts type of subject such as history and American literature.⁸

Village boys led while those from the farm lagged in memberships in school and community organizations. In the case of leadership position in organizations, the village group maintained its first position, farm-reared males moved into second place, and the open-country nonfarm category lagged.

After controlling for the built-in association in the case of the farm-

⁷Paul B. Wilson and Roy C. Buck, *Pennsylvania's Rural Youth Express Their Opinions*, Pa. Agr. Expt. Sta. Prog. Rept. No. 134, May 1955.

⁸For a detailed statistical treatment of these qualitative factors see Paul B. Wilson, unpub. Ph.D. thesis, *Personal and Social Characteristics Associated with Educational Achievement Among Rural Young People in Pennsylvania*, 1956. Dept. of Agr. Econ. and Rur. Soc., Coll. of Agr., Pa. State U.

reared boys in their choice of farming as an occupation upon completion of education, there was no clearcut relationship between choice of occupation and place of residence. Approximately 44 per cent of the farm-reared group indicated farming as their first choice of occupation to be entered after finishing school.⁹

When the boys were asked to state what they believed their parents' choice of occupation for them would be, farm-reared boys gave farming as the answer in approximately 50 per cent of the cases. For other residence categories white-collar occupations were chosen most frequently.¹⁰

The parents of farm-reared males were less likely to be rated as high participants in community organizations by local leaders. On the other two indices of family status, success in business and general community standing, no clearcut variation attributable to residence was observed.¹¹

The termination of public school education came a little earlier for more farm-reared males than rural nonfarm males. Sixteen per cent of the farm boys dropped out of high school. The proportion of village males not completing public school was 13 per cent. The open-country nonfarm group occupied a mid-position on this account.¹²

This admittedly sketchy summary of qualitative differences at the time of residence in the parental home points to the following conclusions which need to be kept in mind as the analysis progresses:

In general it appeared that the farm-reared male in Pennsylvania stood on the threshold of the adult world of work and responsibility with a fairly great commitment to farming as a vocation, with less experience in participation in community affairs, and with a relatively conservative outlook on life. He appeared to be intellectually capable to compete with his rural nonfarm counterparts though he was not likely to have had as much formal education. He showed no marked deviation from them in personality development. The leadership in his community saw his family as not being a part of a clearly observable cluster on the socio-economic status hierarchy.

A Note on Post High School Education

Fifteen per cent of the village-reared males entered college as compared to 12 per cent for the open-country nonfarm and farm-reared young men. Vocational-type post high school training was less prevalent for all residence categories with approximately eight per cent from each entering this type of education. For all groups, continuing education after high school seemed to be not a matter of where one lived or even the

⁹ Paul B. Wilson, *op. cit.*

¹⁰ Wilson, *ibid.*

¹¹ Wilson, *ibid.*

¹² Wilson, *ibid.*

presence of superior intellectual ability. The factors accounting for selectivity in post-high school training centered on those attributes making up a socio-economic complex which produced a young person who was expected to continue education. For example, it was found that for all residence categories, continuing education after high school was closely associated with whether the parental family was judged, in the eyes of community leaders, as being economically successful, active in local affairs, and enjoying a position of good community standing.¹³

The above observation supports the commonly held sociological hypothesis that people to a large extent behave in response to expected roles outlined for them by their associates. The role definition takes shape in the community through the interplay of the various socio-economic forces acting between people and their associates. Out of this comes a kind of value judgement about what is expected. This judgement is internalized in the actor, the person, and provides a set of guides for decision and action.

Entering the World of Work and Adult Responsibility

In most instances high school graduation took place in the spring of 1949. In the following two-year period the majority of the young men had begun the major steps necessary to sever those ties which hinder the attainment of a significant degree of independence from the parental family. Full-time work, marriage, and leaving home, the big events in the transition years, were already beginning to be major factors demanding attention and decision.

The direction of migration in this post high school period was generally urbanward for those who changed residence. The farm residence, however, retained 69 per cent of its original number of young men; while the open-country nonfarm and village retained 70 and 63 per cent respectively. The farm-reared group contributed only 14 per cent to the city as compared to approximately 25 per cent for each of the other residence categories. There was only a very slight migration to more rural residence.¹⁴

Migration during this early period was largely confined to short-distance moves in and about the home community and county. Seventy-five per cent of the sample lived within the county in which they were first contacted in 1947. This prevalence of short-distance moves continued to support the first of Ravenstein's laws of human migration.¹⁵

¹³ Wilson, *ibid.*

¹⁴ John H. Allen, Roy C. Buck, and Anna T. Wink, *Pulling Up Stakes and Breaking Apron Strings*, Pa. Agr. Expt. Sta. Prog. Rept. No. 136, Aug. 1955.

¹⁵ E. G. Ravenstein, "On Laws of Migration," *J. Royal Stat. Soc.*, 1885.

It was difficult to draw more than tentative conclusions about the occupational structure in 1951. Military service and post high school education combined to take a large percentage out of the civilian labor force. Sixty-five per cent of the male sample were working at full-time civilian occupations in 1951. Of these, approximately 70 per cent were employed in some form of blue-collar occupation. The remaining 30 per cent were equally divided between white-collar employment and farming.

Aside from the association between being reared on a farm and working on a farm, there was no clear relationship between place of residence and type of occupation. Nearly one third of the farm-reared males were farming in 1951. In many instances they continued in a partnership on the home farm which had been established prior to high school graduation. There was a slight tendency for white-collar employment to be associated with village residence.

The weekly income received in 1951 differed significantly among the three residence groups. Village-reared males led with a mean weekly income of \$57.00, followed by open-country nonfarm reared young men with \$56.00 and lagging was found the farm-reared group with a mean weekly income of \$49.00.¹⁶

In almost every instance and especially for farm-reared males a history of frequent job changes after entry into the labor force was set off by a low first-job weekly salary. By 1951 this mobility appeared to pay off in that a history of job changes prior to 1951 was found to be with the exception of village-reared males, associated with a higher weekly salary when compared to those making no change. The initial income advantage upon entry into the labor force on the part of the occupationally stable groups was lost to some extent as a result of the job changing on the part of those whose initial full-time salaries were lower. It appeared, at least in this very early period, that some income advantage was realized through changing occupations.¹⁷

In summary, one sees at the time of high school graduation and shortly after, certain forces shaping the adult role. The farm-reared group lagged a little in proportion entering higher education. While there was no evidence of a major outward migration from the home communities on the part of any residence category, the farm-reared males exhibited more "stickiness" than the other residence groups. It was clear by this time that by and large only the farm-reared category of males would go into farming. Farm-reared males who sought employment other than farming appeared to be obtaining work of approximately similar type to that of their rural nonfarm counterparts. The possible exception was their slight under-

¹⁶ Allen, Buck, Wink, *op. cit.*

¹⁷ Allen, Buck, Wink, *op. cit.*

representation in white-collar work. On the other hand, farm-reared males lagged in income to the extent of \$8.00 per week when compared with the village-reared male.

One gets the picture in this early stage of the transition years of the beginnings of a lag on the part of farm-reared males in the fulfillment of the equilibrium model outlined earlier. The potential for doing fully as well as rural nonfarm young men was generally present, but it appeared to an observable degree that opportunity to make full use of the potential was a little less likely to be recognized by farm-reared males; or circumstances might have been such that they could not capitalize on the opportunity. Whatever the situation one must conclude that in the aggregate, they did not enter the adult world of work fully abreast with their rural nonfarm counterparts.

The Young Adult

The analysis now shifts to the socio-economic situation of the young adult male with a rural background. The time is 1957, ten years after the initial contact and approximately six years after the period summarized above. The average age for the group is 26.

The 1957 residence classification and location

By 1957 urban areas had gained 29 per cent of the male sample. The village contributed relatively more than the open-country nonfarm residence class; while the farm contributed least to the urban residence category (table 1).

The significant feature of the distribution of residence in 1957 in relation to the 1947 residence was that the latter continued to be a good predictor of the 1957 residence class. One in five of the village-reared males never moved during the 10-year period as compared to approximately one in four for the other 1947 residence categories. For those who did move, the change was very likely to either a similar residence category or into the urban area. There continued to be only a very slight movement to residences more rural than in 1947.

It is of interest to note that if those who never moved are added to those whose moves were to a residence category similar to 1947 the village category leads with a total of 57 per cent of its original number being classified as village residents in 1957. The percentage for the open-country nonfarm category was 54, while the farm retained the smallest proportion, 45 per cent. It needs to be made clear at this point that farm residence does not mean that the person was necessarily farming. This will be elaborated later.

That the urbanward trend continued cannot be denied. However, if

TABLE 1. THE 1957 RESIDENCE CLASSIFICATION OF YOUNG ADULT MALES WHO WERE PENNSYLVANIA RURAL RESIDENTS IN 1947

1957 residence	1947 residence							
	Farm		Open country		Village		Total	
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
Never moved*	64	25	50	26	111	20	225	23
Farm	51	20	3	2	7	1	61	6
Open country	40	15	53	28	47	9	140	14
Village	48	17	32	17	198	37	273	28
Urban*	58	23	51	27	180	33	289	29
Total	256	100	189	100	543	100	988	100
Moved with parents	10		9		27		46	

No information in 17 cases.

* Never moved $\chi^2=2.98$ N.S.
Urban $\chi^2=6.97$.05

migration occurred during the ten-year period, the probability of the change or changes resulting in a more urban residence was reduced by a strong tendency to move to a residence classification similar to that occupied previously.

The 1957 location of residence continued to support Ravenstein's first law in that the bulk of those who changed residence over the ten-year period had not ranged far from the home community.¹⁸

Nearly one fourth of the young men had never moved. Sixty-one per cent of those who had changed residence one or more times were living in the county in which they were residing in 1947. Twelve per cent were living in an adjacent county and eight per cent were living elsewhere in the state (table 2).

A chi square test of the relationship between the 1947 residence classification and location of the 1957 residence did not support the hypothesis of relationship. There was a tendency, however, for the proportion living outside the state to increase when the 1947 farm, open-country nonfarm and village residence classification were compared in the order mentioned.

The 1957 occupation

The farm residence category continued to produce farmers and farm laborers. Further it was observed that the village and the open-country nonfarm residence categories produced more professional persons than the farm residence category. The operative classification of work drew fewer persons with farm background. For other occupational groupings

¹⁸ E. G. Ravenstein, *op. cit.*

TABLE 2. LOCATION OF 1957 RESIDENCE OF YOUNG ADULT MIGRANT MALES WHO WERE PENNSYLVANIA RURAL RESIDENTS IN 1947

1957 location	1947 residence							
	Farm		Open country		Village		Total	
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
Within same county	127	62	93	63	271	59	491	61
Adjacent county	28	14	20	14	50	11	98	12
Non-adjacent county in same state	18	9	11	7	37	8	66	8
Out of state	31	15	24	16	102	22	157	19
Total	204	100	148	100	460	100	812	100
Never moved	64		50		111		225	
Out of country	2		0		1		3	
No information	1		4		7		12	
Within same county	$\chi^2=0.44$		N.S.	Non-adjacent county	$\chi^2=.21$		N.S.	
Adjacent county	$\chi^2=1.27$		N.S.	Out of state	$\chi^2=4.48$		N.S.	

there was no clearcut relationship with the 1947 residence.

Only 13 per cent of the farm-reared category were farmers and farm managers in 1957. In addition 12 per cent were farm laborers. It cannot, however, be concluded that this represents the proportion going into agriculture. The relatively early period of the occupational cycle allows plenty of time for additional accumulation in the farming category. It must also be remembered that in many instances there were other male offspring in the parental farm families who may be in line to take over the family farm. The point to be made at this time is that in the early period of the employment cycle about one out of four of the farm-reared male sample segment was engaged in farming; with approximately one in eight being a farmer or farm manager (table 3).

Another observation worth noting was the very low percentage of the entire male sample engaged in common labor. Only 14 cases were employed in this category in 1957.

The operative classification claimed the greatest proportion of the male sample (39 per cent), the open-country nonfarm-reared group leading with 46 per cent engaged in this type of work in 1957. Next was the craftsman and foreman category (18 per cent), where the open-country nonfarm-reared group continued to lead with 22 per cent. In third place was the professional category (10 per cent), with the village contributing 13 per cent of its sample segment, followed by the open-country nonfarm and farm with 8 and 7 respectively.

By 1957 the place of residence of childhood and early youth seemed to be a slightly stronger selective factor in classifying occupations than in 1951 when the only clear relationship was that between being farm reared and entry into farming. This calls to mind the rather exciting hypothesis

TABLE 3. THE 1957 OR MOST RECENT OCCUPATION OF YOUNG ADULT MALES WHO WERE PENNSYLVANIA RURAL RESIDENTS IN 1947

1957 occupation	1947 residence							
	Farm		Open country		Village		Total	
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
Professional	17	6.5	16	8.1	73	12.9	106	10.3
Farmers & farm managers	35	13.3	2	1.0	2	0.4	39	3.8
Managers, officials & proprietors	10	3.8	5	2.5	23	4.0	38	3.7
Clerical	19	7.2	19	9.7	61	10.8	99	9.6
Sales workers	15	5.7	11	5.6	32	5.6	58	5.7
Craftsmen & foremen	42	16.0	43	21.8	101	17.8	186	18.1
Operatives	74	28.1	90	45.7	237	41.8	401	39.1
Service workers	8	3.0	4	2.1	15	2.6	27	2.6
Farm laborers & foremen	32	12.2	1	0.5	2	0.4	35	3.4
Laborers, except farm & mine	5	1.9	1	0.5	8	1.4	14	1.4
Military Service	6	2.3	5	2.5	13	2.3	24	2.3
Total	263	100	197	100	567	100	1027	100
No information on 24 cases.								
Professional	$\chi^2=8.29$		P = .02		Operatives		$\chi^2=11.60$	
							P = .01	

of Thomas that any given factor may function with differential strength over a period of time in attempting to account for selectivity in social mobility.¹⁹

Reference was made earlier to the fact that a farm residence for a young adult did not necessarily mean that he was farming. Many of the farm-reared group reporting nonfarm occupations in 1957 continued to live on the home farm, or were living with in-laws who were farmers.

The 1957 income

An attempt was made to relate the 1957 income to the 1947 place of residence. The gross income was calculated on a weekly basis. In the case of farmers and farm laborers procedures were worked out to assign dollar value to the various perquisite arrangements. No statistically significant difference was found among the three 1947 residence categories (table 4).

The mean weekly salary for the entire sample was \$86.00 with the farm, open-country nonfarm, and village residence-of-origin categories reporting \$85.00, \$88.00, and \$86.00 respectively.

Remembering the income situation for the sample in 1951, it will be observed that gaps observed among the residence groups at that time have been closed. The overall increase in the six-year period was \$32.00 or approximately 60 per cent of the 1951 income. The farm-reared group

¹⁹ Dorothy Swaine Thomas, *Research Memorandum on Migration Differentials*, Social Science Research Council Bulletin 43, New York, 1938.

TABLE 4. THE 1957 OR MOST RECENT GROSS WEEKLY INCOME OF YOUNG ADULT MALES WHO WERE PENNSYLVANIA RURAL RESIDENTS IN 1947

Weekly salary	1947 residence							
	Farm		Open country		Village		Total	
	<i>(Dollars)</i>	<i>Num- ber</i>	<i>Per- cent</i>	<i>Num- ber</i>	<i>Per- cent</i>	<i>Num- ber</i>	<i>Per- cent</i>	<i>Num- ber</i>
15- 29	5	2	5	3	7	1	17	2
30- 49	22	9	8	4	26	5	56	6
50- 69	53	21	31	16	107	19	191	19
70- 89	78	31	66	34	200	36	344	34
90-109	51	20	49	26	136	25	236	24
110-129	20	8	19	10	44	8	83	8
130-149	11	4	3	1.5	16	3	30	3
150-199	8	3	7	4	11	2	26	3
200-300	4	2	3	1.5	5	1	12	1
Total	252	100	191	100	552	100	995	100
Mean weekly salary	\$85.22		\$87.85		\$85.96		\$86.34	

No information on 56 cases.

F ratio = .368 N.S.

realized the largest increase, followed by the open-country nonfarm, and the village-reared young men.

While farm-reared males reached into the lower salary ranges in a little greater frequency than the other resident groups, they were in a slightly better position at the upper end of the salary scale with nine per cent reporting over \$130.00 per week income as compared to seven and six per cent of the open-country nonfarm and village resident categories respectively reporting in this range.

Summary

This paper has been an attempt to reproduce, in an admittedly summary fashion, selected processes thought to be of significance in understanding the transition years from youth to young adulthood. The case in point was a sample of rural-reared males in Pennsylvania. The time span involved was ten years, covering in the life of young people the period between ages sixteen and twenty-six. The problem was to discover the extent to which place of residence in childhood and early youth was a significant factor contributing to differentiating processes of spatial and occupational mobility as well as certain allied attributes. Place of residence in the early years was selected as the primary independent variable, because of the traditional public and scholarly concern for the relative position of farm-reared elements of the population in the total social and economic fabric of society.

By and large the analysis presented evidence which tended to redefine

the hypothesis of marked differentiation between socio-economic outcomes of farm-reared and rural nonfarm reared young adults. The place of residence appeared to function with varying strength depending upon the factor being investigated and the time of investigation during the ten-year period. This might well have been expected for it is a well-established sociological fact that social and cultural changes do not move uniformly. There are leads and lags. That certain aspects of the rural cultural heritage and social structure function differentially in time and in relation to certain indicators of adult life patterns, would perhaps be a more precise statement of the hypothesis.

THE IMPACT OF TECHNICAL ADVANCE AND MIGRATION ON AGRICULTURAL SOCIETY AND POLICY

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THE heart of any serious policy problem is a conflict of deep-seated value judgments. In our generation, the central problem of agriculture is one of excess capacity and relatively low income. In the classical view, this is a short-run affair because in the long run outfarm migration will shift excess farm workers into nonfarm employments until that combination of land, labor and capital is reached where equal rates of return are realized from similar resource uses in all parts of the economy.

These facts give rise to five questions: What are the main value judgments that have guided national policy making since early times? What is the model of social organization that traditionally has been viewed as promising fulfillment of these values, and what important events shaped it? What is the connection between these values and the tremendous drive for technical advance that unfolded our Machine Age, including modern scientific agriculture with its burdensome excess capacity and relatively low income? Does outfarm migration offer a long-run solution to this excess capacity and low income position of agriculture? What are the implications of our findings on these questions for national policy formation, especially for farm policy and programs?

I

In developing the key policy-guiding judgments of value, a useful point of departure is the observation that among the most dominant drives of men is the aspiration for ever higher status and the fear of falling to a lower one than they now enjoy. As here used, status is the standing—the approbation and esteem—that one covets for himself in the eyes of all observers, including his own. The potency of the status striving is evident on every hand. It sets the tone and shapes the style of the whole man, influencing the dress he wears, the kind of car he buys, his choice of associates and friends, the stand he takes on vital issues, the way he

¹The opinions expressed in this paper are those of the author, and do not necessarily represent the views of the Farm Economics Research Division, Agricultural Research Service, or the U. S. Department of Agriculture.

At numerous points this paper draws heavily from the author's unpublished "Value Judgments as Principles of Social Organization," Proceedings Papers of the agricultural economics and rural sociology section of the annual meeting of the Southwestern Social Science Association, Galveston, Texas, March 27-28, 1959. Copies are also available from Farm Economics Research Division, Agricultural Research Service, USDA, Washington, D.C.

bears his troubles, and the courage he displays under stress and strain. Its vital center is a love of merit and aversion to demerit. This sense of merit and demerit is the experience of self-acceptance or self-rejection that arises from the judgment that one demonstrates or fails to demonstrate an equivalence between his capacities and the level of approbation and esteem he covets. William James observed that "no more fiendish punishment could be devised . . . than that one should be turned loose in society and remain unnoticed by all members thereof. If no one turned round when we entered, answered when we spoke, or minded what we did—a kind of impotent despair would ere long well up within us from which cruellest bodily tortures would be a relief. . . ."² This is but half the truth. An equally fiendish punishment is the feeling that one is so barren of meritorious capacities that he is unable to observe the esteem of anyone. Any equating of the status drive with the mere thirst for popularity thus falls to the ground. We are often popular with others but unacceptable to ourselves. Conversely, a man may feel deeply that the larger community withholds from him or his class their deserts. Then, instead of eating himself out with self-blame, he becomes a formidable animal—a rebel demanding a new social order that will accord him the status his endowments deserve.

Thus including a sense of merit and demerit, the status aspiration can be gratified neither by social esteem alone nor by self-esteem alone. The complete objective is twofold: To be the kind of person who deserves self-approbation, and to belong to a social order that recognizes one's deserts. In line with this double objective, the status drive includes commands of mind and conscience concerning ways and objects of life that are to be prized because they best demonstrate meritorious capacities. These commands are the value judgments that are a people's chief guides to policy formation, and in this way shape their destiny.

Early in American life this status aspiration unfolded into three groups of value judgments that are especially relevant to our problem. These groups are called the work ethic, the democratic creed, and the enterprise creed.

Three judgments of the work ethic are pertinent here:

(1) The first is called the Work-Imperative. Negatively expressed, this imperative is the judgment that one fails to deserve the esteem of self, family, country, and even all men if he places love of backward or "easy" ways above love of excellence in any useful employment of his choice. Positively expressed, it is the judgment that the proper way of fulfilling the status striving is to be the kind of person who (a) merits his own high

² James, William, *Principles of Psychology*, Vol. I, pp. 293-294, Henry Holt and Company, New York, 1898.

esteem because of proficiency in his chosen field and therefore (b) deserves a social order that prizes him for the same reason. As explained elsewhere,³ this imperative stems from the early Protestant shift of the older Christian concept of God's work from the Holy Callings to secular occupations. Mainly through this shift superior industry became the widely accepted test of merit early in American life. With the so-called materialistic income incentive thus encompassed in the sense of merit, the drive that leads the farmer to adopt new cost-reducing and output-increasing technologies is obviously not merely the love of lucre but the aversion of mind and conscience to deeds that deserve disesteem.

(2) By including superior industry as the proper test of deserts, the Work-Imperative also includes a unique concept of justice. This concept is expressed in the judgment that society owes to each man (a) the equivalent of his contributions and (b) also equals access to the means necessary for developing his creative potential to the fullest extent possible. The first of these is called commutative justice; the second is the justice of equal opportunity, sometimes called distributive justice.

(3) Finally, in American lore the work-ethic includes the judgment that, in their productive capacities, individuals and the Nation alike possess ample means for closing the gap between their present circumstances and their aspirations. According to this faith, human capacities are quite sufficient to improve without limit the lot of the common man. To believe less puts a ceiling on the American Dream and belittles the promises of American life.

The second set of key policy guides in American life are the two central value judgments of the democratic creed: (1) All men are of equal worth and dignity, and (2) none, however wise or good, is wise enough to have dictatorial power over any other. In line with these judgments, the essence of freedom is not the absence of collective restraints on individual action but the power and privilege of each to an equal voice in shaping the rules which all must observe for the sake of the common good.

The third set of key policy guides throughout American life are the judgments of the enterprise creed. Two of these are especially relevant to our problem: (1) Proprietors, or their legal representatives, deserve exclusive right (or power) to prescribe the working rules of their production units. (2) Therefore, a prime function of government is to prevent anyone, including government itself, from invading the otherwise unfettered power of proprietors to run their businesses as they please.

While all three creeds are deeply rooted in American character, there is no necessary tie between them. A people may feel deeply committed

³ Brewster, John M., "Technological Advance and the Future of the Family Farm," *J. Farm Econ.*, 40:1597-99, Dec. 1958.

to the work ethic and yet totally reject the enterprise creed.⁴ Again, men possess no specific meritorious capacity in equal degree; hence there is a sharp clash between the democratic imperative that we accord all men a status of equal dignity and worth and the work-ethic imperative that we accord them differential status in line with the outturns of their productive effort.

II

The fact is, however, that in American life these disconnected creeds became interlocked in one of the most unified belief systems in history.⁵ This came about through a 300-year development and use of what is often called the Lockean model of social organization. This model takes its name from John Locke who, in his *Treatise on Civil Government*, first held that the good world lies in a sharp division of society into a big economic sphere and a tiny political sphere of popularly controlled government that keeps its hand off the "State of Nature," later named the free market. Of the many events that entered the shaping of this model, five are especially relevant to our problem. Three of these have their setting in the Old World; two in the New. In substance, they are as follows:

(1) The Protestant shift of the older Christian concept of God's work from religious to secular occupations precipitated an irreconcilable clash with the feudal segregation of the managerial and labor roles into lords and serfs. Resting on the widespread belief in prowess as the proper test of merit, this division of functions lodged in those who lived without work the dignity, the approbation, and esteem which the Ages had posited in the lords of the land. In such a world there was no room for the new conscience of the Work-Imperative.

(2) But the 17th century philosophers, especially John Locke, neatly resolved this conflict by imaginatively slipping both roles inside the same skin.⁶ Against a feudal order, the philosopher flung the concept of a natural society in which Nature combines within each individual (or family) the hitherto separate managerial and labor roles of lord and serf. Simple as this trick may seem, it gave birth to the democratic creed and the enterprise creed, and tied both these and the work ethic into a single

⁴For discussion of Work-Imperative in Communism, see Dorothy Thompson's column, *Evening Star*, Washington, D.C., Oct. 17, 1957. Also pertinent are Kenneth S. Lynn's *The Dream of Success: A Study of American Imagination*, pp. 67-97, Little Brown and Company, Boston, 1955; and Sydney Hook's "Grim Report: Asia in Transition," *New York Times Magazine*, April 5, 1959.

⁵See observations of Gunnar Myrdal, *An American Dilemma: The Negro Problem and Modern Democracy*, pp. 1-6, Harper and Brothers Publishers, New York and London, 1944.

⁶The next few paragraphs draw heavily from John Locke, *Treatise on Civil Government*.

whole by setting up the judgments of all three as laws of Nature—not of men.

Consider first the democratic creed. To affirm that Nature combines in the same skin the hitherto separate managerial and labor roles of lord and serf is to say that, in the very act of birth, she makes each man a king. To men with this imagery of themselves, no laws of Nature are more obvious than that (1) all are of equal dignity and worth, and that (2) none, however wise or good, is good or wise enough to have arbitrary power over any other.

Again, the philosopher set up the Work-Imperative of the Protestant founders as a law of Nature. For, to affirm that Nature combines within each skin the managerial and labor roles is to say that she outlaws prowess as a test of merit because this test leads to their separation into lord and serf, which is contrary to nature. Again, through the same combination of roles, Nature limits the size of firms to the point at which families can do most of the required labor and management. In this way, she so limits income inequalities that she obviously (a) returns to each the equivalent of his contributions and also (b) gives to each equal access to the means needed to develop his productive potential to the fullest extent possible. Thus the natural order embodies the concept of commutative and distributive justice, inherent in the Work-Imperative.

In like fashion, the Lockean model sets up the judgments of the enterprise creed as laws of Nature. For, in combining in the same individual (or family) the hitherto separate managerial and labor roles of lord and serf, Nature renders households and firms identical. This means that the real estate and implements of firms are but extensions of the personalities of proprietors—the embodiment of their planning and productive efforts. Therefore, to interfere with proprietary power to run production units as one pleases robs proprietors of their Nature-given freedom.

In the absence of collective restraints on the natural rights of each to be equally lawmaker, judge and policeman, men would turn on each other like wolves. But the philosopher declared that ample remedy lay in a process of mutual consent whereby rational men agree to eliminate insecurity of life and property by setting up a central group called the government and handing over to it their natural rights of lawmaker, judge, and enforcement officer with the tacit understanding that the prime function of government thus instituted is to protect the natural rights of proprietors to run their businesses as they please.

(3) A third condition rooted this Lockean model and its creeds of life far more deeply in the American character than in the European. This condition was the emergence of a system of family farms as the expansion of the Old World into the New pushed past the outposts of the Atlantic

seaboard. As explained elsewhere,⁷ the belief-forming role of this institution in our national life is immense. By combining into the same individual the hitherto separate managerial and labor roles of lord and serf of the Old World, it gave to the American through direct experience a much richer imagery of the precepts of the Lockean model than the European could ever gain indirectly from the philosopher's verbalizations of this model.

(4) But as handed down by the philosopher, this model had a conspicuous loose end. For he offered the statesman no evidence, except intuition, that if government only withdrew its guiding hand, the State of Nature would lead self-seeking individuals in ways that would most enrich the commonwealth. Instructed through the ages in the opposite belief, the statesman felt this intuition severely overtaxed his credulity. To ease this burden of undocumented faith was the historic mission of the classical economist. Among his numerous contributions to the Lockean model, two are especially relevant here.

The first is that no business can be big enough to affect the prices at which it buys or sells. As government was the only power then big enough to affect price, the wise statesman would stop government from meddling with the economic domain because Nature guarantees that no one can increase his income except by returning to society a correspondingly greater equivalent through improved industry.

Again, if only government will keep its hand off, Nature will see to it that every scrap of resource will be shifted among various employments until it makes its maximum contribution to the gross national product. For, under the guidance of competitive rivalry, owners are always tending to transfer their resources from lower- to higher-income uses until all similar resources are earning equal rates of pay. Thus the natural order is like Tennyson's "far off divine event toward which all creation moves." At all intermediate points, lower incomes in any employment than can be explained by transfer costs or personal tastes is *prima facie* evidence of underemployment of resources. But, given sufficient time, owners will remedy this waste by shifting their services until rates of pay for all similar resource uses come into balance.

In line with this logic and animated by an income incentive embedded in the judgment that one fails to merit the respect of himself and his fellows if he refuses the opportunity to better himself, either in or out of agriculture, over 10 million farm people since 1930 have migrated from up the creeks and around the bends, down highways hundreds of miles long in quest of better paying nonfarm employment. And for the same

⁷ Brewster, *op. cit.*, pp. 1599-1603.

reason, the 20 million remaining in agriculture in 1955 had reorganized into larger units most of the land in the 1.5 million farms that the 10 million migrants had left behind. Such Herculean feats strongly suggest that in all walks of American life people are so impregnated with the aspiration for merit through superior industry that one may be a bit skeptical of attempts to explain the low-income farm problem as being the result of atypical values of disadvantaged farm people.

(5) A fifth condition rendered the Lockean social model a far more potent vehicle of the previously specified creeds of life in America than anywhere else. This condition was the 200-year interaction of a virgin continent of opportunities with the attitudes of the Work-Imperative. In America the Malthusian law of life did not apply, and minds were emptied of memories of past defeats. However severe the privations and cruelties of the new continent, it would nonetheless turn into marvelous shapes and forms under the touch of patient industry. As men saw the oak in the acorn, so they envisioned farms in swamps and thickets, ports and cities in river bends, paths of commerce along the wild-game trails, and even jewels in the grubby earth if only they dug and hoed enough.

In this way romantic imagination at length unfolded the American Dream as the assurances of Nature and Providence alike that in their workmanlike capacities even the humblest men possess ample means of closing the gap between their present circumstances and their aspirations. Enkindled by this magnificent Dream, all who struggled with the American wilderness gained a new thrust of practical drive that almost literally enabled them to mount up as with wings. For, within a century after the formation of the Republic they had conquered their vast wilderness—a feat that even the Founding Fathers had thought would take a thousand years. This achievement re-enforced the promises of the American Dream. In this way, the Dream as well as the work ethic, the democratic creed and the enterprise creed, became interlocked in America, as nowhere else, with classical economic doctrine, even though laymen had never heard of it. In no other country have the tenets of this doctrine evoked such affection. For, here the interaction of a continent of opportunities with the attitudes of the work ethic transmuted into a boundless optimism the pessimistic attitudes that shackled the English founders of this doctrine. This enabled classical economic theory here to become a far more formidable system of judgments than the Old World ever shared concerning what ought and ought not be done for the good of all. Here as nowhere else, anyone who advocated departure from sound economic doctrine could be annihilated with the retort that he was putting a ceiling on the American Dream.

III

This three-century interlacing of the Lockean model with the otherwise disconnected judgments of the work ethic, the democratic creed, and the enterprise creed released an avalanche of vital energies that literally reshaped the world. For our Machine Age, including modern scientific agriculture, is the outcome of America's premachine beliefs and value system and not the other way round. This is particularly true with respect to the Work-Imperative. This truth best unfolds from the vantage point of an earlier day when land was so abundant as to be "dirt cheap" while the human factor was so scarce as to be extremely dear. In this setting, nothing was more obvious than that fulfillment of the thirst for demonstrating deserts to higher standing through superior industry lay in discovering new implements and machines that would increase the amount of land and materials which one could handle per unit of time. In response to this belief, American farmers became notorious tinkerers long before the birth of agronomists and agricultural engineers. It is an inspiring experience to read how the most outstanding of these tinkerers such as McCormick, Oliver, and Deering, first conceived and brought forth many of agriculture's implements and machines.⁸

But farm people were the first to recognize that from their own tinkering could never come the technical knowledge that was needed to give vent to their aspiration for a better life through superior industry. They were sure that this new kind of knowledge would have to come to them as a specialized service from a larger social order, which did not then exist. For the kind of knowledge then supplied by the existing order was serviceable, by and large, only to those exempt from manual employments, such as lawyers, artists, and ministers; it was useless to the ordinary farmer seeking a cure for a sick calf or trying to make two blades of grass grow where only one had grown before.

With the passage of the Morrill Act in 1862, there began emerging a government that increasingly undertook responsibility for supplying farmers with the practical knowledge needed to develop their productive potential to the fullest extent possible. In the history of the Republic, there is no finer chapter than that on how the Nation's effort to meet this need began with little more than a sprawling farm on which some experienced farmer instructed young men in the best-known farm practices of his time, and within the short span of a century unfolded into the modern system of Land Grant Colleges, Experiment Stations, and Extension Services that is today the wonder of the world.

⁸ See, e.g., Bidwell, Percy Wells, and Falconer, John I., *History of Agriculture in Northern United States 1620-1860*, pp. 204-216 and 281-305, The Carnegie Institution, Washington, D.C., May 1925.

From these vast incubators of new farm know-how there now flows an ever hastening stream of technical innovations on so many fronts and at such rapid rates as to threaten the very existence of the typical farmer. But, even though he may thus live almost under the very crack of doom, no article of faith is more deep seated than his unquestioning identification of technical advance with progress. Though it slay him, yet will he trust it.

So rapid is the rate of technical advance that total farm output capacity averaged eight percent more than consumption needs from 1949 through 1956.⁹ No letup to this manufacture of excess capacity is in easy sight. For, even if technical inventions in agriculture came to a dead halt, it is estimated that the food and fibre demand of our 1975 population could be met through a full use of presently available farm technologies.¹⁰

In this way the work ethic now meets the peculiar irony of fate. For the very technical advance, long called for by the aspirations of this ethic, now generates an excess farm output capacity that depresses earnings of farm workers substantially below those of workers with like ability in nonfarm employments. In 1956, for example, it is estimated that the income gap between farm and nonfarm families of similar labor capacities was roughly \$2,000 on the average. Gaps of this magnitude appear greater than can be satisfactorily explained by cost of moving to nonfarm jobs, by preferences for country life, and by other factors that are consistent with perfectly functioning markets. This means that there are necessarily impediments to the migration of farm people into nonfarm employment at rates needed to fulfill the efficiency goal embedded in the work ethic.

IV

Thus, given the economy that we actually have, the question arises if outfarm migration offers a long-run solution to the problem of excess capacity and low income in agriculture. The central issue here is this: What is the locus of the impediments to the rate of outfarm migration that is needed to wipe out this excess capacity? Do they reside in the peculiar characteristics of farm people? Or do they reside in the rigidities of the nonfarm labor market?

A widely prevailing answer is that they lie within the farm people themselves, mainly in the form of ignorance of nonfarm employment opportunities and lack of capital for moving expenses to nonfarm jobs. This answer means that the excess-capacity problem is not really serious after

⁹ Bonnen, James T., "American Agriculture in 1965," in Joint Committee Print, 85th Cong, 1st Sess., *Policy for Commercial Agriculture*, table 1, p. 147, U.S. Govt. Print. Off., Washington, D.C., Nov. 22, 1957.

¹⁰ Barton, G. T., and Daly, R. F., "Prospects for Agriculture in a Growing Economy," *Problems and Policies of American Agriculture*, Iowa State U. Press, 1959.

all because the cure merely requires a bang-up program of economic education on three fronts: A widespread information service among farm people concerning higher-paying nonfarm employment opportunities; an expanded labor recruitment service for such opportunities; and grants of public funds for moving expenses. Through such economic education the Nation will eventually meet its work ethic sense of duty to give each person an equal opportunity to develop and enjoy his productive potential to the fullest. More important, this will enable everyone to fulfill all our premachine creeds of life by merely shifting his labor services from one employment to another as he pleases until all similar resources receive equal remunerations in farm and nonfarm employments. Thus, the recommended long-run cures of excess farm output capacity have a consoling quality because they leave undisturbed all the comforts of conventional faith.

However, in his paper here yesterday, Hendrix demonstrated that in essentials the logic of a perfectly competitive nonfarm labor market precludes identifying the impediments to outfarm migration with peculiar traits of farm people. For, perfectly competitive conditions for profits and survival necessarily force nonfarm employers to extend to farm people both the knowledge of higher-paying nonfarm job opportunities and the needed means of moving to them. Such conditions would force employers to do this through competitive bidding and labor recruitment to the point where they equate marginal costs and returns for this activity, just as for their other activities.¹¹ The very fact that they do not do so is *prima facie* evidence that the impediments to outfarm migration do not lie within farm people but in nonfarm labor market imperfections which normally keep nonfarm employers from making use of the full supply of workers who want jobs at wages they pay.

Hendrix further pointed out three main reasons why the American farm plant is exceedingly vulnerable to the danger of becoming saddled with the major burden of the Nation's underemployment. These are the competitive features of agriculture; the selective processes by which underemployment is distributed in the economy; and agriculture's large natural labor increases, on the one hand, and declining labor needs, on the other. If a perfectly competitive agriculture were coupled with a similarly competitive nonfarm labor market, outfarm migration would prevent even the most rapid technical advance and limited market outlets from giving rise to excess farm capacity and low per capita farm income. As matters stand, however, agriculture is a highly competitive industry in a world where major departures from perfect competition are widespread

¹¹ Hendrix, William E., "Income Improvement Prospects in Low-Income Areas," p. 1065.

and where normally there is much less than full employment (defined as the optimal allocation of labor). In these conditions are rooted the impediments to outfarm migration in the amount needed to remove the excess capacity arising from rapid technical advance. This puts farmers in a cost-price squeeze that so siphons off the benefits of their improved industry to the rest of society that they are the lowest paid of any major occupational group.

A frequently suggested remedy is a program of collective restraints on individual producers that would enable all farmers to achieve an optimum output from the standpoint of themselves and the public alike. In principle, farmers tend to want such a program to protect them against a market that denies them an equitable share of the benefits of their technological advance. But they also resist it in the belief that it is wrong to deny proprietors the right to run their businesses as they please.

In this way, the farmer's technology puts his conscience in a jam. At issue is not a question of the democratic freedom of each to have an equal voice in laying down the rules which all must observe for the sake of the common good; the issue is the kind of malady from which the farmer most seeks liberation. Does he most prize a democratic order that restrains him from farming as he pleases in order to free him from being deprived of an equitable share of the benefits of his increasingly superior industry? Or does he most want a democratic order that subjects him to this injustice but leaves undisturbed his proprietary power to farm as he pleases? Either choice is consistent with our democratic creed. Thus, the value conflict that is generated by our highly productive farm technology and limited markets is strictly a clash between the deep-seated love of commutative and distributive justice, inherent in our work ethic, and the equally deep-seated love of unfettered proprietary (or managerial) power inherent in our enterprise creed.

Until we really face up to this clash of values, it is questionable if we can ever find a program that can resolve the farm surplus problem in line with our work ethic concept of justice and our democratic concept of freedom. In two ways, capacity for such hard policy decisions is crippled by the carryover of the logic of the Lockean model. By fallaciously imputing to farmers the impediments to migration, this logic dangles before us all the comforts of the conventional faith. It does so by saying that, after all, we really have no hard policy decisions to face because in the long run a stepped-up program of economic education will wipe out farm distress. Again, the same logic can be, and often is, used to show that the farmer's low income position is *prima facie* evidence of his inefficiency which, in turn, "proves" that his demand for an equitable share of the benefits of his increasing productivity is a mere coverup of his desire to

feed at the public trough.¹² In this way, classical economic logic becomes a means of using the farmer's very work ethic to convict him publicly of moral delinquency.

V

Under the analysis thus far developed, migration offers no adequate solution for the problem of excess agricultural capacity; however, attention is now directed to the fact that it could become an adequate solution under each of three conditions:

(1) The first has been called a "positive program of laissez faire." Such a program would use government to break up concentrations of economic power to the point of restoring classical competition in all sectors of the economy, thus permitting freedom of entry by workers into nonfarm employment in conformity with classical economic theory.

Transcending the details of such a program is the fact that its inspiration stems from both a pronounced pessimism and an unrealistic optimism that have characterized classical liberalism from its inception. The pessimism is the belief that men are so dominated by self-seeking that they are incapable of remaining free from each other's aggression and at the same time shouldering responsibility for using their productive capacities for the maximum enrichment of all. Simons reflects his pessimism in these words:

Political determination of relative prices . . . implies settlements by peaceful negotiations of conflicts too bitter and too irreconcilable for deliberate adjudication and compromise.¹³

In 1822 Bentham, the father of modern utility calculus, laid bare the root of this pessimism in this succinct judgment: "Man, from the very constitution of his nature, prefers his own happiness to that of all other sentiment beings put together."¹⁴

Prior to the rise of classical economic doctrine, this low estimate of the human capacity for social or moral choice was used as evidence to show that for the sake of security of life and property, sensible men will agree to invest the Prince with absolute power to impose whatever rules he deems necessary to enrich the commonwealth and expand its power and glory.¹⁵ Thus the novel insight of the classical economist was not a fresh appraisal of men's capacity for responsible choices but the vision of Na-

¹² Fisher, John, "The Country Slickers Take Us Again," *Harpers Magazine*, December, 1955.

¹³ Simons, Henry C., *A Positive Program for Laissez Faire*, Public Policy Pamphlet No. 15, U. of Chicago Press, Chicago, 1934.

¹⁴ Bentham, Jeremy, *Works*, Vol. X, p. 80.

¹⁵ For example, see Thomas Hobbes, *Leviathan* (first published in 1651), esp. chap. 13, 14, 17, and 18.

ture as a *deus ex machina* that lifted from their backs the burden of such choices, and therefore, if left alone, would free them from mutual aggression in spite of their power lusts. As Newton's logic enabled men to see in the law of gravity the mechanism by which the Almighty swings the stars in their orbits, so the logic of the classical economist enabled them to see in the competitive model the mechanism by which He uses even "the wickedness of men for the achievement of His purposes."¹⁶ For, under this model not even the shrewdest scoundrel can make a dime except through ways that return its equivalent to society—a fact so admirably caught up in Mandeville's *Fable of the Bees*. Thus the Lockean model, undergirded by classical economic doctrine, is obviously a secularized version of Providence. It takes care of us in spite of our own meanness.

But, as Neibuhr points out, Providence won't stay secularized. Neibuhr never questions the pessimistic vein of classical liberalism, but he rightly shows that it also contains the incredible optimism that self-seekers are so rational that they will resolve the conflict between their egoism and the social interest with such hog-tight commitments to a "positive program of laissez faire" as to render concentration of power impossible.¹⁷ As this illusion is shattered by the steady shift of the American community to the principle of "power and countervailing power" as means of fulfilling its aspirations, classical liberals are often so torn by conflicting beliefs and values that they have no clear counsel to offer on pressing policy issues. For example, one of their ablest voices speaks thus:

... There is an undeniable natural tendency toward increasing inequality and concentration of power under free enterprise, which political action seems the only way of counteracting. . . . But it is my conviction that any great extension of political action is incompatible with political liberty, that "control" will call for more control and tend to run into complete regimentation—calling also, before it goes very far, for regimentation of thought or expression—and finally into absolutism, with or without a destructive struggle for power.¹⁸

One is thus reminded of Aesop's donkey, afflicted with equal degrees of thirst and hunger. Placed midway between a tub of water and a bale of hay, the poor beast finally perished for lack of ability to decide which it wanted most—the hay or the water.

(2) Outfarm migration could become a long-run means of removing excess agricultural capacity if it were coupled with national policies effectively designed to accelerate economic growth to the point required to

¹⁶ See Adam Smith's famous figure of the "Invisible Hand" in his *Wealth of Nations*, book IX, chap. 7.

¹⁷ Neibuhr, Reinhold, *The Children of Light and the Children of Darkness*, esp. pp. 2-29, Charles Scribner's Sons, New York, 1953; also Neibuhr's *The Self and the Dramas of History*, Scribner's, 1955, pp. 41-43.

¹⁸ Knight, Frank H., *Risk, Uncertainty and Profit*, Augustus M. Kelley, New York, 1948, p. liii.

absorb the Nation's underemployment in face of both rapid population growth and rapid technical advance of a labor-saving and output-increasing nature in the farm and nonfarm sectors. The growth rates of our economy are much short of this requirement. Recessions have marred four of the last ten years. Economists are increasingly emphasizing that the Nation is falling much short of its growth potential.¹⁹

National policies to convert our underemployment into useful services might well take the form of wiping out the Nation's poverty in public goods such as schools, hospitals, highways, parks, playgrounds, police services, and metropolitan housing. The Nation tends to seek such policies because of its work ethic judgment that any country deserves disesteem if it prefers waste to the fulfillment of its productive potential. The grip of this judgment on the conscience of the Nation is highlighted by the guilt feelings evoked by the Soviet launching of the sputniks.²⁰

But such policies involve stepped-up government spending and directed investment. Thus they raise a serious question on the compatibility of the so-called free market and sufficient economic growth for full employment with wage and price stability. Therefore, while such policies are sanctioned by the national work ethic and are also consistent with the democratic creed, they are nonetheless severely inhibited by our enterprise creed, which equates expansion of the government's economic role with such evil nouns as "socialism," "bureaucracy," "extravagances," and the like. As a consequence, the work ethic sense of guilt over the spectacle of large areas of underemployment glides into the subconscious except when brought to the surface by such dramatic incidents as the sputniks. Even then, it is so counteracted by the enterprise imagery of malevolent government that it does little more than induce a cycle of guilt confessions, gurgitation of "high principles," and return to sin again.

(3) Finally, outfarm migration could become a means of wholly removing excess capacity in agriculture if it were coupled with a national program which (a) actually used comprehensive supply controls to limit aggregate farm output to aggregate demand at stable prices, and which (b) also transferred to the nonfarm sector responsibility for the excess labor not needed in agriculture. This requires that the excess be shifted to the public sector as a relief load when not employed.

From the standpoint of traditional values, such a program has numer-

¹⁹ For example, see various papers in *Employment, Growth and Price Levels*, Hearings before the Joint Economic Committee, 86th Cong., March 20, 23, 24, and 25, U.S. Govt. Print. Off., Washington, D.C., 1959.

²⁰ Typical examples: Paid advertisement of the International Latex Corporation in *New York Times* of November 10, 1953; also Dorothy Thompson's column in the *Evening Star*, Washington, D.C., October 17, 1957; Walter Lippmann's column in the *Washington Post*, October 10, 1957; and James Reston, "The U.S. and Science," *New York Times*, November 16, 1957.

ous virtues. It would prevent monopolistic and oligopolistic sectors of the nonfarm economy from using a competitive agriculture as the escape valve for the bulk of the Nation's underemployment. It would also extend to agriculture an equitable share in the benefits of its rapidly increasing productivity. Still again, it would extend to agriculture the legal rights of power and countervailing power that are now mainly the possession of corporate industry and organized labor.

But such a program involves expansion of the government's economic role; therefore, it clashes sharply with the enterprise creed. Worse still, it falls under the indictment of the Work-Imperative. For, by transferring to the public sector as a relief load the excess labor not needed in agriculture and not fully employed in industry, the program would put the Nation's underemployment and associated poverty into a public gold-fish bowl. This would arouse the whole work ethic conscience against any social order that officially exiles large numbers of people from useful social roles in keeping with their productive potential. Exposure of this painful gap between deeply held values and actual performance is now avoided largely because millions of inadequate farm units enable the great bulk of the Nation's underemployment to masquerade under the guise of keeping busy. Any program that ripped away this mask would be severely inhibited by the need of the national conscience for concealment of its delinquencies.

VI

The foregoing analysis leads to two main conclusions and certain implications. On the one hand, agriculture is a competitive industry in a larger world where less than fully competitive markets are widespread, and where there is normally much less than full employment (defined as the optimal apportionment of labor among occupations). On the other hand, agriculture is also afflicted with a rate of technical advance that expands aggregate farm output appreciably faster than the growth of effective demand for farm products. These conditions preclude outfarm migration by itself from providing a long-run solution to the problem of excess capacity and the relatively low income in agriculture. Imagination can envision various types of national policies that would enable migration to resolve these problems. But if and as any such policy is born, we shall have to resolve deep-seated value conflicts that the Machine Age has generated among our premachine creeds of life.

Three implications deserve mention: (1) No simple solution is in sight for the Nation's underemployed manpower in agriculture because America, by and large, has no clear conception of what she most wants: neither the kind of people nor the forms of social organization she most prizes and aspires to achieve. Without this knowledge no people can

realize more than a fraction of their creative potential, whether economic or otherwise. (2) This does not mean that our older sense of values must be junked. It does mean that our older creeds are in for some teeth-jarring shakeups that may lead to wider visions of their essential meanings and the forms of organization and action appropriate to their fulfillment. (3) In this re-examination of our older creeds, the economist has a unique role to play. For the chief guide to his reflections is the equilibrium model whose thoroughgoing mathematical structure renders it bone-dry of any value judgment, including the judgment that efficiency itself is a desirable end. Devoid of any policy norms whatsoever, the sole utility of this model is that of a guide to measuring cost-price consequences of any and all policy alternatives, none of which are ever given by the model itself but may come from any quarter, including the economist when he steps out of his capacities as a craftsman. In measuring the price-cost consequences of policy alternatives, the economist can provide policy makers with data that they sorely need in reaching decisions on what is wrong with the social order and what should be done about it. In this fashion, he can perform indispensable service to the larger effort of our Age to re-envision its goodly heritage in more fruitful ways of fulfillment. The more effectively he serves this purpose, the more he escapes entrapment in the Lockean premise that our heritage of the work ethic, the democratic creed, and the enterprise creed can find fulfillment only through a division of society into a big economic sphere of atomistic individuals, governed by natural law, and a tiny political sphere of popularly controlled government that abstains from tampering with Nature's economic domain.

COMPETITION IN THE FOOD TRADE

Chairman: William H. Nicholls, Vanderbilt University

CHANGING COMPETITION IN THE FOOD TRADE

A. C. HOFFMAN

Kraft Foods, Chicago

THE matter of competition has always seemed to me a very involved one, with ramifications running considerably beyond what is usually thought of as the field of economics. Moreover, I have never felt that the concepts and working tools of classical and neo-classical economics were altogether adequate either to the understanding or the measurement of competition. This inadequacy, I think, stems mainly from regarding competition as an abstraction unto itself, or as something apart from the social and economic institutions which condition it. So I shall ask your indulgence to roam around a bit before getting directly down to the subject in hand.

Some Postulates and Preconceptions

I shall begin by raising the question of what is it that ultimately shapes social and economic institutions, and even our value judgments concerning them. This question goes to the very heart of political economy and the related social sciences, and each of us will find his answer to it in terms of his own preconceptions, not only about economics but about human values themselves.

Economic determinism

My own argument about this very complex matter starts with the simple proposition that mankind tends ultimately to adopt whatever economics institutions will provide him with the highest possible material standard of living with the least expenditure of human toil. In other words, whether we are to have an economy of big business or small business, or whether the ownership be corporate, cooperative, private or public (or an admixture of all of them) will depend on how each enterprise type measures up to this physical standard of efficiency in the use of human resources. This is, of course, economic determinism. I do not hold to it rigidly, nor as applicable to all situations at all times. But I find more in economic history to confirm it than to refute it.

If we apply this concept of determinism to the American economy today, what do we see?

In many industries, perhaps one should say in most of them, modern science and technology has long since compelled multi-million dollar plants for its best and proper application. In these, we have gone beyond the point of no return toward large-scale enterprise. Moreover, there is no longer a very significant public agitation to restore small enterprise in these fields. Even most economists seem to have reconciled themselves to concepts of "workable" competition rather than "perfect" competition when dealing with them. Perhaps one might conclude from this that our value standards of what is good or bad in the way of economic institutions, and even economic "laws" themselves, are not immutable in these times.

In the food industries there is a somewhat different situation, with large numbers of firms in a wide variety of types and sizes. Partly this is because of the nature of agricultural products themselves; and partly it is because medium-sized and even small firms seem to be less disadvantaged from a technological standpoint than in most other parts of the economy. I think it is correct to say that the evolution of most large food companies and cooperatives, while having primary roots in technology, is due more to the economies of mass distribution than of mass production, which of course remains consistent with determinism. I would expect the food industries always to show a relatively great array and variety of firms—unless, as Henry Ford once predicted, somebody figures out how to synthesize milk.

Agriculture itself shows a still different situation from the standpoint of determinism. Here technology thus far has in large measure adapted itself to the existing economic institution (i.e., the family farm), rather than greatly changing the institutional pattern, as in industry. In a sense, this would appear to represent a refutation of determinism—although the increase in the optimum-sized family farm, and things like vertical integration, begin to cast a shadow of doubt even here. Quite obviously agricultural economists are very well aware of the importance of technology, as indicated by your writings and the fact that last year you made this the central theme of your annual meeting.

Regardless of whether we agree or disagree on economic determinism, it brings us to the first great fork in the road as regards public policy toward competition. Those who are essentially determinists will sincerely believe that no particular type of business enterprise, not appropriate to the best possible use of modern science and technology, can be permanently sustained by legislative action or judicial decision. Those who with equal sincerity are not determinists will have more faith in the efficacy and righteousness of such measures. The issue is not all black or all white, and perhaps only a small minority (of which I am not quite one) will be found at the extreme ends of this dichotomy. But it is a basic one.

Types and numbers of competing firms: Relevance to competition

Now let us shift ground and take a look at the firm itself. Here my premise is this: As between large and small firms, there are differences in kind as well as of degree. By this I mean that a large firm will perform a given economic function *differently* than a small firm would do the same job—not simply do the same thing on a larger scale. Coupled with this is the corollary proposition that there are no diseconomies of scale. I am prepared to defend this latter proposition in detail, but there isn't time here.

Now if you will grant for the moment that one or both of these propositions may be true, then where does it lead as regards the all-important problem of measuring the effect of competition on price and output?

Classical economics measured the effect of competition mainly in terms of numbers of competing firms. It postulated the condition of "perfect" competition (one in which there were so many firms that no one of them had any significant part of total supply) as that most likely to result in maximum output and minimum price. The modern inheritors of this doctrine necessarily play this "numbers" game with fewer competing firms, with concepts of "workable" rather than "perfect" competition, and with more sophisticated analytical methods. But most of them continue their mathematics and geometry on the basis of the old—and I think very wrong—postulate; namely: that the total industry supply curve is the same regardless of the number and type of firms involved. On the basis of this postulate, the conclusion is all but inescapable that the fewer the number of competing firms, the less the total supply and the higher the price.

But is this really true? If different types and sizes of firms have different *kinds and levels of costs* or if there are no diseconomies of scale, then numbers of competing firms are no longer a valid indication of the public interest. Who can say whether steel prices, for example, would be higher or lower if there were eight, or eighteen or eighty steel firms?—or even only one, under public ownership or control, of course. Please do not misunderstand my implication here—I don't pretend to know the answer either! If I had to make an approximation, I think I would talk to a steel man, a cost accountant, and a classical economist working with the tools I have just condemned, and then strike an average of their guesses. But I hope I should retain enough skepticism to realize that an answer as to the proper number of competitive firms for steel, however expertly obtained would not necessarily apply to the pickle industry.

Technical research and development: Relevance to competition

I should like next to remark upon technical research, which I think is having a very great effect on our patterns of competition, not only in foods

but throughout the economy. Such research is expensive, and is carried on today mainly by the larger types of business enterprise and by public agencies. Unquestionably this research is a significant factor of growth and progress throughout the economy. If any doubt this, they have but to study the annual statements of business companies, many of which show the proportion of current sales based on past research. Smaller enterprises are not completely disadvantaged here, because many of their suppliers, as well as public and private research agencies, can and do provide the results of technical research appropriate to their needs. But on balance, I think the ability to finance technical research is one of the inherent advantages of enterprise scale.

This, however, is not the main reason I bring up technical research from the standpoint of competition. The effect of this research frequently—and I think usually—is to increase the number of competing firms for any particular product.

This seems to be especially true for the food industries during the past 15 years. Much of this technical research in foods has tended to increase the number and variety of food forms available, the new forms frequently being handled by a different set of firms than those which handled the older forms. For instance, most vegetables can be obtained these days in fresh, canned or frozen form—and some of them, notably potatoes, now in dehydrated form. Each of these forms has, for the most part, a different set of processing and wholesale distributing firms. The same generalization applies, in greater or less degree, to all the so-called “convenience” food forms. Obviously this is relevant to the nature of competition.

Individualism, initiative, and freedom

No one can look upon the American economy these days without realizing the increasing difficulties which confront anyone who, starting from scratch, aspires to own and operate his own business enterprise. There are, of course, large areas in the economy, notably in agriculture and the food industries, where small enterprise continues to have opportunities. But for most of us these days it is our destiny that we be part of a group undertaking, whether as business bureaucrat, government bureaucrat, or college professor.

There are many who believe sincerely that all manner of dire consequences will flow from this, both for society and the individual. They feel that it tends to destroy the individual initiative upon which economic progress depends; that it forces men into conformity with the patterns of their respective groups; and even tends to limit freedom itself.

They may be right—who knows? Certainly what is happening to our institutions these days is not in conformity with the Jeffersonian tradition of

economic individualism. But there is more to it than this. Individual initiative has many well-springs in human nature. A man may exercise it in running his own business and he may also exercise it as part of a group undertaking. A chemist in the laboratory, a salesman on his beat, a professor in the classroom—these also may be expected to put forth their best efforts in order to get a raise from the boss, to impress their associates, or maybe even just to gain a measure of self-satisfaction in a job well done. Not all men are so inspired, nor were they ever under any economic system. But I think enough of them will be around, under any economic system, to keep the wheels of economic progress going.

As to the effect of modern economic institutions on human freedom, each must find his answer within himself according to his own set of values. I found mine many years ago in my favorite pundit, George Bernard Shaw. He once wrote that freedom is a very difficult concept, upon which the greatest minds differed and with which even he himself had trouble on occasion. But, he went on to say, whatever freedom is, or is not, the practical *form* of it in an economic sense is *leisure*—to get away from toil, to read a book or just do nothing at all. From this I went on to conclude for myself that I would regard whatever set of economic institutions would provide mankind his material needs with the least amount of human toil as also giving him more freedom. This brings us full circle back to the first premise of this paper.

Now, all hands being armed with a set of general postulates and preconceptions—either those I have advanced or a better set of your own—we are ready to discuss directly the subject in hand.

Recent Changes in Over-All Structure and Organization¹

Among the larger food processors and companies doing business on a national basis, there has been a steady but not spectacular growth since

¹ One can scarcely pick up a trade journal for any line of industry these days without reading a notice to the effect that this or that independently-owned company has sold out to a larger one. In most cases—and this is a matter of record in many Federal Trade and antitrust cases—the first approach was made by the smaller company to sell, rather than by the larger one to buy. The reason is frequently very simple—the owners of the smaller company were faced with income and inheritance tax problems which made it desirable for them to sell in order to get liquid assets. I am referring here not so much to the very small companies, but to independently-owned ones with capital assets often valued in millions of dollars.

I don't know what can be done about this, because tax level's don't show much prospect for reduction; and it would be patently unfair to other taxpayers and other forms of business enterprise to grant special tax privileges to capital and income from independently-owned enterprise. Congress recently amended the tax laws to permit installment paying of estate taxes over a period of several years where a large part of a man's estate consists of stock or ownership of independent companies. This, of course, is mere postponement of tax liabilities, and it remains to be seen whether it will be effective to reduce the rate of sell-outs.

World War II. For the most part this growth has come by adding products to the line, rather than by significantly expanding market share for old-line products. There are, of course, some exceptions in both directions to this latter statement, but I think such statistics as are available regarding market share among the larger food firms pretty much confirm it.

Much of the growth of the leading food companies in recent years has come through internal expansion, rather than by acquisition. Where mergers or acquisitions by such companies have occurred—and there have been several important ones—it has usually been to expand the company into new product lines. Where large companies have made acquisitions of production and sales facilities for their old-line products, it has nearly always been to round out their operations geographically.

The adding of new products to the line, by any company large enough to take them on, is something I would expect to continue in the food business. The reasons, of course, are very simple. The costs of advertising and merchandising, of physical facilities such as plants and branch warehouses, of technical research and development, and of management and staff services, are somewhat in the nature of an overhead; and the more products a firm has to carry these semi-fixed costs, the lower its over-all cost structure in relation to total sales. It might be added parenthetically that public policy, to the extent that it attempts to restrict share of market, will encourage product diversification as a firm strives for greater sales volume.

Perhaps the most spectacular growth rate among food companies, both processors and distributors, has been among the upper medium-sized firms—those ranking down from the leading five or ten companies in each food line. Here the causal factors have usually been geographical expansion, and adding products to the line, to obtain the advantages of greater enterprise scale. Especially has this been true among chains of supermarkets, with smaller chains selling out to larger ones which wanted to expand geographically.

To me, one of the most noteworthy developments in the food field during the past ten years has been the growth of the voluntary and cooperative chains of independent enterprisers.² As of today, these cooperative organizations are doing nearly 50 per cent of the total grocery business, compared to less than 30 per cent as recently as 1947. For several decades, the percentage done by corporate chains has held steady at about 38 per cent.

² I was among those who predicted in writing 25 years ago that the independent enterpriser had a dismal future in grocery retailing. I was wrong, because I did not correctly foresee that he would apply, by means of cooperative organization, the same techniques of mass distribution as the corporates. To those of you who are young economists, let my unfortunate prediction as to this be a lesson for you! Whatever set of working tools you choose to adopt for yourself, don't apply them with too much rigor and dogmatism.

What is the relevance of these over-all structural changes for competition in food products?

First, I would conclude that there continues to be such a great array and variety of food firms at all levels of processing and distribution that the overall competitive situation has not significantly changed in terms of numbers of competing firms and market share.

Secondly, I think it is correct to say that all forms of competition—price pressures, greater efficiency, better merchandising methods, technical research and product development—are more intense today than at any time since World War II. And the competition is between more firms than ever before which are *able to match each other* in the application of mass production and distribution methods.

Finally, I would emphasize again the greater product diversification which is taking place among food companies. This, probably as much as any one other single factor in recent years, is broadening competition among them.

Cross-Weave Competition in the Food Industries

Early in this paper, I referred to differences in *type* of firm as being directly relevant to the kind of competition which results, and I should like now to apply this concept in more detail.

We usually think of competition as working horizontally between similar types of firms, which may differ in size but not essentially in mode of operation. In foods, however, the competitive pattern is much more complicated than this.

Competitive forces for most food products run three ways: First, there is the competition between firms of the same general type in one particular channel of processing and distribution. Then there is the competition of parallel channels comprised of somewhat different types of firms. And finally, the evolution of vertical integration so common in foods brings it about that many firms stand in the relation of buyer and seller to each other, while at the same time competing horizontally at various stages in the marketing process. This is why I refer to it as cross-weave competition.

To illustrate, nearly all farm products move forward from farmer to consumer in the following channels. First, there are the relatively small independent or cooperative firms which exist for nearly every farm product at assembling and first processing stages, and at subsequent distribution points. Then there are the larger *integrated* processor-distributors for each major product category (the meat packers, the canners, the cereal companies, etc.), ranging downward in size from the national companies. What they have in common is at least some degree of integration between processing and distribution, and they will frequently have their own brands on a local or regional basis, if not a national one. Then for some

farm products there are larger producer cooperatives which have integrated the marketing of their product all the way up to the retailer, with nationally known brand names, which represent still a different channel. Last, but by no means least, are the integrated chain store systems (both corporate and cooperative) with processing and assembling facilities for many of their products reaching all the way back to the farm level.

The first thing to be said about this pattern is that it has *not* been traditional to the food industries. Prior to the advent of mass production and mass distribution of foods, most farm products were handled at each stage by the same type of firm—small assemblers and processors at the farm level, unintegrated processors and specialized distributors at the next level, with the product then feeding through independent wholesalers and independent retailers to the consumer. At each of these levels, the competition was between firms of a somewhat similar type. It was only with the evolution of the integrated processor-distributor, the big producer cooperatives, and the corporate and voluntary chains that the alternate types of firms and channels described above has come into being.

It seems to me self-evident that competition in the present pattern will be of a different and more effective type than that existing years ago. Now the competition is not only between similar types of firms in the same channels, but also between different types of firms in other channels. Some firms are large, some small; some are integrated, some not; some advertise, some do not; some carry on technical research, and some do not. Finally, the products of all meet on the supermarket shelf where the housewife makes her choice among them.

For those who are concerned about connivance in the fixing of food prices, the cross-weave competitive pattern just described should be reassuring. Would-be connivers to fix prices of particular food products must deal not only with other firms of the same type, but also with other types of firms in other channels with a different set of self-interest patterns.

Supermarket Retailing and Its Relevance for Competition

The supermarket is the focal point of competition in the food industries. I am by no means alone among agricultural economists in pointing this out—Mehren, Cochrane, and many others among you have written about and discussed it. I agree with most of what they have written.

The competitive significance of the supermarket can best be seen in a few simple statistics. A well-stocked super will carry seven or eight thousand food and household items of various brands and package sizes. The housewife has free choice among them, and if she doesn't like what she finds in one store, she can walk down the street to another. It is pretty hard to imagine an oligopolist, or even a monopolist, getting much of a toe-hold in a situation like that.

The fight for shelf space

There is another and perhaps even more important facet to competition at the supermarket level. It is the fight among manufacturers and distributors of food products to get their products on the supermarket shelf. It has been estimated that there are well over 100,000 retail food items being offered to supermarket buyers who have room on their shelves for only 6,000 or 7,000 items—I have seen estimates even considerably higher than this.

These figures show why it is that the competitive and merchandising pace among food manufacturers today is so terrific. Every new brand or type of food product must fight for a place on the shelf, and every established brand must fight almost as hard (and in some cases harder) to stay there.

The competition for shelf space takes several forms. One obviously is price. Unless a product is priced so that consumers will throw it into their shopping baskets frequently, the grocer will throw the product out of his stores, for his shelf space is valuable to him.

Another form of competition for shelf space is good merchandising. Good merchandising is whatever it is that makes a consumer want to buy your product. Even the psychologists who have tried to fathom consumer motivation are not altogether sure what this is, but it is obviously many things. Among the factors for good merchandising are a product of good quality for the price offered, one that is conveniently and attractively packaged, eye-catching on the shelf, and advertised in today's market.

Private vs. nationally-advertised brands

Undoubtedly the greatest competitive slugfest going on in the food industries today is the fight between the manufacturers' brands and the private brands of the corporate and cooperative chain store systems. This is a good one, between two kinds of competitors whose brand interests clash, and in which the housewife can't possibly get hurt so long as the fight goes on.

Both the chains and the manufacturers are trying to build their respective brand franchises, but for somewhat different reasons.

In the case of the chains, they use their private brands partly in order to build a franchise for their store system. Since their private brands are to be had only in their own stores, they hope by building these brands to attract more customers to them. In this connection, it should be pointed out that some chains promote and feature nationally-advertised brands for the same purpose (i.e. to get customers into their stores), so the fight is not altogether one-sided as between chains which do, or do not, have private brands. The second purpose of the chains in having private brands is to realize whatever profits are to be made on the private-branded

merchandise itself, which they frequently assemble and manufacture in their own integrated facilities.

The food manufacturer, of course, tries to build his brand franchise to gain a preference for his product in the mind of the consumer. This he does in a variety of ways—by product research and development, by good merchandising methods, and by advertising. It is both difficult and costly to develop and hold a brand franchise these days—sometimes the food manufacturer gets his money back and sometimes he doesn't. To the extent that the chains are successful in establishing consumer preferences for their private brands, they will be increasingly put to the same type of promotional expenditures as the manufacturers.

Another facet to the competition is that between firms which pack the private label products for the chains. As already pointed out, some of the larger chains pack some of their private label merchandise in their own manufacturing plants. Others make contractual arrangements with outside packers, who may or may not have a manufacturer's brand of their own. Among the large food manufacturers, some pack private label brands for the chains to sell in competition with their own nationally advertised brands, and some do not. Again, the pattern of competition is cross-weave.

I have no idea how the contest between private label and manufacturer's brands will come out, or what different forms it may take in the years ahead. If either side starts to pull ahead significantly, I would expect the other to come up with something to restore the balance, because both are pretty well matched in skills and resources.

Vertical Integration

So much is being said about vertical integration these days, that I feel apologetic in adding to it. I have read most of what Adelman and Mueller and Cochrane³ and others have written on this subject, and with most of what they have to say I agree—not quite with all of it.

The food industries show several different types of vertical integration,

³ See Willard Cochrane's paper, "Changing Structure of the American Economy: Its Implications for the Performance of Agricultural Markets," *Journal of Farm Economics*, May, 1959. Dr. Cochrane and I are agreed that we are likely to see more and not less of all types of vertical integration in the years ahead, but for different reasons. He explains this development mainly in terms of what he calls the "twin imperatives" of procurement—i.e. "time and conditions of delivery and quality and appearance attributes of the product." I explain the cause of vertical integration mainly in terms of the efficiency concept briefly outlined in this paper. Dr. Cochrane's concept would lead him to say that a chain store system, for instance, would go into poultry farming in order to obtain a regular supply of eggs of the quality it desired. My explanation would be that it would go into poultry farming only if it could thereby lower its first cost of eggs, which is another way of saying that it would be more efficient in the function of poultry farming than most poultry farmers themselves. Dr. Cochrane suggests that the difference between us in the matter of vertical integration may be only a play on words. I think it goes much deeper than this.

each having a somewhat different explanation, but with a common thread of similarity, as I shall try to show.

There is, first, the vertical integration of chain retailers, in which the retail function is nearly always integrated with the wholesale warehousing function, and frequently with manufacturing and assembling functions.

Another variant is found among food manufacturers. The larger food manufacturers, and many of the medium-sized ones, have frequently integrated forward toward the retailer with their own sales branch warehouses and sales force. They also have integrated backward, with their own facilities for the local assembling and first-processing of at least part of the farm products which they handle.

Still another type of integration—found increasingly more often these days—is for a firm itself to manufacture, rather than to buy from outside suppliers, certain items like packaging supplies and minor ingredient or plant maintenance items.

Finally, there is the much-discussed vertical integration into agricultural production itself, of which recent developments in the poultry industry are perhaps the best example.

As a generalization, I think it is correct to say that the main reason a firm integrates vertically is to cut its costs and to promote the efficiency of its over-all operation.

Vertical integration, by definition, brings together within a single firm control over performance of two or more successive functions previously performed by separate firms. In a vertically-integrated operation, no ownership transfer (which means little or no selling cost) is required to get the product from one stage in the marketing system to the next. Here alone is a significant part of the cost reduction of which I speak. There are, of course, other reasons for vertical integration: It permits a closer tie-in between successive functions with respect to the planning of operations; frequently it makes possible a better adaptation and full utilization of the physical facilities involved at successive stages; and sometimes it enables a firm to obtain a type or quality of product, or a regularity of supply, not otherwise obtainable.

Finally, government price policy itself has unintentionally contributed to vertical integration. When a large firm, because of the Robinson-Patman Act or other legislation of similar nature, cannot obtain from a supplier a price reflecting the lower cost justified by volume of its purchases, it is led naturally and inevitably to consider manufacturing the product in question for itself. Here, I think, is the explanation of quite a bit of the vertical integrating which has been going on recently. I do not hereby condemn the type of legislation in question—I merely point out some of the things to which it leads.

Now what is the relevance of vertical integration from the standpoint of

competition? So far as horizontal competition is concerned, I would expect it to have little or no effect. As Mueller and others have pointed out, the essence of monopoly is control over the *volume* of supply, and vertical integration in and of itself does not effect this. A vertically-integrated firm may have lower costs or better merchandising control of its own products than an unintegrated one, just as one firm may be more efficient than another in other respects—but neither is this of the essence of monopoly.

It should also be pointed out that an integrated firm competes with a greater complex of buyers and sellers than an unintegrated one. It may be more efficient than one buyer-seller combination, and less efficient than another. Also, it seeks to obtain a satisfactory rate of return on investment at each level of integrated activities, which means it must be as efficient at each and all levels as the specialized firms with which it is competing.

* * *

Before writing the concluding paragraphs of this paper, I read carefully what I had written up to this point. I decided I had best add this personal addendum.

I am afraid I have tried to cover too much ground in this paper. I have raised, treated in cursory fashion—and ruled upon in accordance with my own preconceptions—some broad and controversial issues which have long perplexed far better and more literate minds than mine. In so doing, I have not meant to appear presumptuous, for my purpose has been more to share respect for the complexity of competition than to adduce definitive answers regarding it.

I must also apologize for having brought to the subject no new gimmicks of theoretical analysis, no new statistics, and very little in the way of substantive proof for some of the broad generalizations I have made. I am prepared to defend these generalizations in greater detail, but here again my purpose has been more to invite your thinking than to advance my own ideas.

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ECONOMIC AND LEGAL CONCEPTS OF COMPETITION

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I. Economic Concepts of Competition

COMPETITION is the selective mechanism of a private-enterprise economy. Given free choice by buyers and sellers, there is always some profit to be made by producing more efficiently than one's rivals and bidding trade away from them, to the point where everyone's profits have been eroded to the bare minimum. The only way to escape the pauper's fate is for the business enterprise to seek out innovations in products, processes, or sources of supply which yield new profits, whereupon the cycle is repeated. The action of business enterprise is a perpetual flight from the zero-profit abyss. To alter the metaphor, and borrowing from the language of tax enforcement, it is in the interest of enterprise either to *avoid* or *evade* the unending pressure on profits—avoidance by innovation, evasion by stopping the pressure or at least weakening it; and the degree of success in evasion is what we call the degree of monopoly.

The "power" to attain economies of production and distribution may be lumped in with the "power" to limit competition—by those who are interested only in protecting their incomes, which either kind of "power" can do. But if we are interested in the *results* of one kind of "power" or another—and if we aren't, we have no particular expertise—then of course there is a solid body of economic theory to let us conclude that it makes a good deal of difference for the national income whether businessmen predominantly avoid or evade the competitive pressure toward zero profits. If the size and growth of the national income are a matter of first-rate importance, this distinction between one or another "power" is vital.

It is worth while reflecting on another loaded word. The Chief Justice of the United States once called our basic anti-trust statute "a charter of industrial freedom." But of course there is no such thing as freedom in general—there are many particular freedoms. Their number is large, and it is an even number, because exactly half are the deadly enemies of the other half. If a man is free to produce unlimited amounts at low cost, this is brutal coercion applied to the man who cannot now live with that kind of competition. Our avowedly free society is one of constant economic force and compulsion to get things done more efficiently, or else. Small wonder that there is and always has been a demand not merely to redistribute the income generated by the competitive system—e.g., by free public education or progressive income taxation—but to block and moderate its operations. Adam Smith stated of the perennial demand for

protection that "they who preached it were by no means such fools as they who believed it." This is of course true, but it is far from being the whole truth. Judge Learned Hand said of a competitive market that "the spur of constant stress is needed to overcome an inevitable disposition to leave well enough alone."¹ Who wants constant stress? Nothing is gained thereby except a higher national income.

There appear to be three strong reasons why we put a good deal of store on higher production. First, it is a good in itself. Second, it promotes or at least permits a peace between otherwise antagonistic social classes, because if the national income keeps growing, everybody can gain and nobody lose. On this matter of social balance and political stability: there is a tradition that it is fostered by having many small business firms rather than few and large ones, and of tempering the wind to the shorn wolf. If so it makes sense to thwart a competitive process that would eliminate many small firms. The policy has been adopted in France, to name the best-known example; the results have been such that we might well question the theory. The adoption of the Common Market by the Six Nations is basically a choice in favor of fewer firms in Europe, larger firms, more competitors in particular markets, and more competition. This anticipates in part the third reason for needing higher output: the desire for national survival.

Our definition of competition in terms of results is perhaps too vague for the policy maker. As we approach the analysis of various kinds of markets with a view to understanding, something more specific may be needed. Ten years ago, Edward S. Mason suggested that analysis of specific markets be organized around the poles of structure and performance—structure referring to the number of buyers and sellers, presence or absence of collusion, etc.; performance relating to the behavior of prices, costs, profits, etc.² Despite his warning—and language could hardly be more plain—that these two kinds of tests were complementary rather than opposing, structure *versus* performance quickly became a hackneyed slogan, and all good men were called to come to the aid of one or the other. Yet it is impossible to study structure without knowing performance; specifically, one cannot do so elementary a task as to count the number of sellers in a market without first knowing something of the boundaries of the market; boundaries are defined by a gap in the chain of substitutes, or, more generally, the decline of substitution to the point where it may be safely neglected, and this can only be found by looking at price-cost behavior. Where the offerings of rivals have little effect on prices in the

¹ U. S. v. Aluminum Co. of America, 148 F. 2d 416 (C.A.3, 1945), p. 427.

² "The Current Status of the Monopoly Problem in the United States," in Edward S. Mason, *Economic Concentration and the Monopoly Problem* (Cambridge, 1957), pp. 351-370.

purported market, there the boundary must be drawn, whether it falls far inside or far outside or close alongside of a conventional code number in the Standard Industrial Classification, or a convenient political boundary. Number and size distribution are not handed to us at the outset, but are the result of often laborious inquiry.

What is perhaps hardest to accept in this area is not policy advice on what is Good or Bad, but that confession first of primal ignorance, then of tentative hypotheses, that is the start of every decent bit of scientific work. A set of particular facts on structure or performance has got to be treated as a sample drawn from the unknown universe—the market. Since the samples are of facts more or less haphazardly drawn or accidentally revealed, small wonder that they may conflict; in which case, the only honest thing to do is admit it and go back for another sample. If a market appears to have a competitive structure of many business firms, and yet there is stable, permanent price discrimination, for example, which we would not expect under independent action, it is not a question of whether structure or performance is more “right” as a guide to public policy; it is rather that the facts don’t add up. Perhaps we have wrongly designated as one market what is really a set of separate markets, among which supply and demand are only channeled at considerable cost; or perhaps there is something wrong with our price-cost data; or there is some other source of error. But until we have reconciled the facts, we do not do well to strike a pose of statesmanship and say that structurally the industry is competitive; behaviorally it is not; that one or the other is “more important” for public policy and should prevail. There is only one phenomenon here, and that is the competitive process, and our facts on structure and behavior have no value except as they relate to it.

A good deal of ink has been spilled over what is or should be the concept of “workable” competition. My suggestions might be summed up: The economist’s job is essentially to see whether and to what extent it is working. Standards may well differ on how prompt and effective a mechanism we want to have. But this is quite a minor division compared with the resistance to the competitive result as such. If the competitive mechanism is any good, as compared with, say, socialist economic planning, it is as a selector of the more efficient and a suppressor of the less efficient. But this means a constant destruction of vested interests. To the business concerns so afflicted, it is both a personal misfortune, and a national tragedy—surely the public interest, or national defense, or something, requires that they be supported in the “fair” or “reasonable” style to which they have become accustomed. But if we want results—higher output at lower prices, the social peace and national security it brings—then all is as it should be. The clash of interests could not be more direct.

Whether the competitive mechanism is more or less efficient than the

planned economy of the Communist world is perhaps an open question. But it is a safe bet that the least efficient mechanism is the kind the French call *dirigiste*—State intervention not to redistribute the national product or maintain it in the aggregate, but to set or control prices and production in many particular markets. The greatest single drag on Soviet economic growth is probably their failure to solve the agricultural problem, and consequently their need to maintain a huge number of people in the countryside to feed the towns. In the United States the minimizing of the farm population has proceeded since the beginning of our history, without any conscious direction. And it is this enormous advantage which our policy makers are trying to discard. Whatever it is that they have in mind as the primary goal of public policy, it is not greater output.

II. Legal Concepts of Competition

It would be no great exaggeration to call our basic antitrust law, the Sherman Act, an unintended result of building railroads. After 1860 the wormlike masses of local roads were consolidated into the great regional systems we know today. From 1860 to 1890 track mileage and ton-miles carried expanded several times as fast as the rapidly growing national product. A volcanic transformation of markets had to result, as local markets became regional and regional ones national and international.

The logic of competition and of lower costs required larger and more efficient units in many markets, and a thrusting-out of smaller firms. But the businessmen who rushed into the new larger markets were as willing to monopolize them as to compete on a large scale within them. The bigger the better; not for them the distinction between economies of scale and market control. The dispossessed or threatened small businessman felt the same way. He wanted to be rid of threats to his existence, whether because of his higher costs or only because of his lesser size was a distinction without a difference. Furthermore, while he wanted to curb the trusts in his line of business, he wanted for his own real or fancied benefit to let them alone elsewhere. The protest against big business and concentration was therefore doubly confused. First, there was a desire to maintain competition in the consumer interest—including among consumers also farmers and the business firms which bought from or sold to the trusts or rings—and a desire to protect competitors against competition. Equally or more important was the confusion that lumped together size of firm, economies of scale, and monopoly; so that it seemed impossible to destroy or reduce the trusts without also losing efficient production. Economists were of little help, we may add, because they were more concerned with doing good than with understanding markets.

The legends that the Sherman Act aimed to bust the trusts, or to estab-

lish effective competition, have had a surprisingly long life; but the painstaking research of Thorelli³ and Letwin⁴ may have put it to rest. Congress certainly thought it was enacting the common law of the several States and the British jurisdictions, which had not been concerned with market control but with *exclusion*, and which tried to protect *freedom*—but for whom, to do what, was never defined.⁵ Congress certainly accepted the great corporations as here to stay. And Senator Hoar, who wrote most of the Act, defined monopoly as preventing other men from engaging in “fair competition” with the monopolist. His concept of “fair competition” appears from his informal opinion that it would be legal for a group of sellers to agree on a common price and a pooling of profits—complete cartelization—if this was “reasonable” and aimed merely to save the parties “from destructive competition.”

Yet the Sherman Act did not remain that kind of law, and before the twentieth century arrived Senator Hoar’s concept of “fair competition” had been largely removed from it. With lapses and reversals, the Act has come to conform more with what most economists would regard as the criteria of effective competition, at least so far as regards Section I; today, in effect, it proscribes any kind of communication among business firms whose purpose or effect might be to affect prices, divide markets, or limit output. There are still some real ambiguities at the borders, but they are relatively minor. It was not, I think, inevitable, that the law had to develop the way it did; but it was in my opinion fortunate, and the first decisions under the British 1956 Restrictive Practice Act have surprised most observers by the extent to which they have gone that way.

One reason for this success is also a reason for the limits on it. There is a very old legal tradition against conspiracy, and any overt acts by a group of business concerns which tended toward market control could be cast in a familiar legal mold. The law has been less successful with informal arrangements which results from a combination of (a) few sellers, (b) a mutual trust and confidence in each others’ statesmanlike qualities, and (c) a simple and easily understood goal of policy, such as not reducing prices in the face of declining per unit costs, or raising prices annually until the force of competition from outside the industry stops further increase. Where members of an industry think and act in terms of what’s best for the industry, and their prices are set with reference to competition from without, they are acting precisely like a monopolist, who is the industry, and faces competition only from the outside.

³ Hans B. Thorelli, *The American Antitrust Policy* (Baltimore, 1955).

⁴ William L. Letwin, “Congress and the Sherman Act,” *University of Chicago Law Review*, Vol. 23, p. 221 (1956).

⁵ Edward S. Mason, “Monopoly in Law and Economics,” *Economic Concentration and the Monopoly Problem*, *op. cit.*, pp. 332-350.

It is difficult to say how widespread is this phenomenon, but it is not unimportant; the steel industry has of course furnished us with the best example of joint labor-management price-raising statesmanship, to the point on the industry demand curve where it turns elastic by the substitution of other products, or the threat of imports. But so long as it does not appear that there was any communication among the various companies, the antitrust laws probably cannot be invoked, even though it is clear that they have used the public press as their coordinating vehicle.

There is much more uncertainty about the other basic provision of the Sherman Act, the one forbidding "monopolization," largely because there is usually no conspiracy to be proved, no set of overt acts which imply control of a market, but only a company, usually big, organized for some ordinary and legitimate purpose. It is a good deal more difficult to prove that such a concern has substantial monopoly power, and it is also difficult to decide how much is too much, and over how long a period of time. Furthermore, the law forbids not the condition of monopoly, but the act of monopolization. Given the stress on acts, the basic ambiguity whether the law is trying to protect competition or to shield competitors from it, the fewness of cases—which prevents a stable tradition from building up—and lack of economic analysis, we have some odd zig-zags and contradictions. One example must suffice. The Alcoa decision, already referred to, stressed heavily that Alcoa's exclusionary tactics—and exclusion was the dominant theme—consisted in building ahead of demand, and trying to improve the art. There could be no more effective exclusion than that! By implication, the safe course of conduct for a big company was never to upset competitors by innovating, but let them thrive—the first rule of life for a cartelized economy. What gives this anti-social doctrine (which mars—or, if you like, improves—an otherwise impressive opinion) a special ironic force is that in 1937, the year the Alcoa case began its eight-year career, Donald Wallace published his classic study⁷ which demonstrated that, far from building ahead of demand, Alcoa had acted like a monopolist, and dragged its feet, expanding output more slowly than a group of even moderately independent competitors would have done. It is a good example of how the courts, in deciding economic questions, can be cut off from economic knowledge; and it would be hard to prove that matters have improved much since. It is not merely that the courts' standards for antitrust policy may differ from those which others would favor; it is the much more prosaic but basic point that the courts can only with difficulty find out what actually happened, or may happen, since lacking the means of analysis they can be buried in undigested gobs of fact which they do not understand.

⁶ U. S. v. Aluminum Co. of America, *op. cit.*, p. 431.

⁷ Donald H. Wallace, *Market Control in the Aluminum Industry* (Cambridge, 1937).

But perhaps more important than the Court's weakness in getting at the facts of the market was its eloquent statement of the contradiction which is still at the heart of our antitrust law. There is an excellent statement, referred to earlier, of competition as the means of "industrial progress." But only a few sentences later the Court remarked that one might prefer, "because of its indirect social or moral effect, to prefer a system of small producers," and a page or so later: ". . . it has been constantly assumed that one of [the] purposes of the antitrust law was to perpetuate and preserve, for its own sake and in spite of possible cost, an organization of industry in small units which can effectively compete with each other."⁸ In speaking of "possible cost," the judge showed his good economic instinct. The "cost" is the loss of what he called "industrial progress." The more progress, the less protection of small firms against the competition that would destroy many of them. This has been, for seventy years, the basic inner contradiction of the antitrust laws, or, more broadly speaking, of the legal concept of competition. Its basic criterion is *exclusion*—type not specified. But the heart of the competitive process is exclusion of the less efficient.

III. *The Conflict of the Legal Concepts*

I do not know how to state how competitive is the American economy, but there is general agreement that it is more competitive than any other this side of the Iron Curtain, and that the Sherman Act has made at least a positive contribution. But effective competition must always discomfit many competitors, and since the earliest days of the Act, there have always been protests against it as not doing what it was supposedly designed to do—protect competitors against competition. In 1935 an individual who with his association had been criminally convicted and fined for contempt of a court injunction against price fixing directed his attorney to write a law which, since its enactment the next year, has been known as the Robinson-Patman Act. Of course, parentage is not an infallible predictor; but the law did little more than enact the Grocery Code of the NRA, an act which suspended the antitrust laws. The Robinson-Patman Act may with some reason be considered as the food industry's gift to our law, though of course its terms are not so restricted.

This is not surprising. The structure of the food industry is not unique, but some characteristics are rather more strongly marked than in other industries. Very small raw-material units must be brought together for processing, then distributed as products, again in very small units. This means a network of thousands of markets, sometimes intensely competitive, sometimes relatively isolated and therefore controlled by one or a few monopolists either in buying or in selling. But this in turn implies that

⁸ U. S. v. Aluminum Co. of America, *op. cit.*, pp. 427, 429.

there are profits to be made in breaking out of the isolated market and getting access to more alternative customers or suppliers, and this usually demands at least a certain minimum size. The farm co-ops have done most of the job of breaking through the decentralized rural market; at the other end of the scale, the chain stores have led the way in widening the local wholesale and retail market; they have had their reward of hostility. The marketing of food is a long and complex chain, with many points of transfer of goods; and every point at which the transfer becomes expensive because of restrictive action (often manifested in heavy selling-advertising outlays), it becomes profitable for buyers or sellers or both to integrate vertically. Of course, this could often happen by chance alone, or because of local cost peculiarities, but it would not be so widespread. Again there is a reward in profits and hostility.

The third important characteristic of the food industries is the stability of size. In effect, a firm with ten plants is a sample of ten, and will experience fewer profit fluctuations than a one-plant firm, to the extent that the various plants are independent, even if the average profit is the same. Hence a small plant will have more trouble staying liquid and solvent than the no more efficient small plant of a large company; probably the most extreme example is the chain store. The actual importance of this relation is unknown, and doubtless it varies greatly among industries. The variability of profit rates, and the relation with size, is one of the most poorly-explored areas in economics; and a current USDA series dealing with milk processors presents one of the very few pieces of evidence for any industry.⁹

Given these three factors—decentralized local markets, often with few participants; vertical integration as a means of escaping monopoly; and the stability advantage of size and multiple operations—it is clear that the small competitors will direct their grievances at the large. And the later antitrust laws—the Clayton and Federal Trade Commission Acts, the Robinson-Patman Act, and the fair trade laws—have been disproportionately concerned with marketing and with the food industries. The fair trade laws are too obvious for comment, and the need for brevity permits me only to discuss the Robinson-Patman law, a remarkable piece of legislation which must be viewed rather closely—that is, by looking at the way cases actually are decided under it—to be fully appreciated. It is often described as aimed to curb the monopsony power of large buyers; but this is clearly incorrect, since the Act purports to forbid discrimination by sellers, and it is a simple analytic error to reason from monopsony on the buying side to discrimination by sellers; there is no connection between

⁹ U.S.D.A.—A.M.S., *Milk Distributors: Sales and Costs* (quarterly).

the two. As a matter of fact, the FTC Chain Store Investigation¹⁰ turned up very little price discrimination in the economic sense—i.e., net of cost differences.

The Robinson-Patman Act is a law not against price discrimination but against price differentials and against vertical integration. Where some buyers are more integrated than others, and perform some services for themselves, the law requires that they be charged the same price as others. There is of course a pretense of allowing "cost justification," though not as to brokerage service, quantity limits, or services furnished by the seller; here costs are officially disregarded. But in all other instances "cost justification" is simply a ritual designed to thwart the recognition of facts on cost differentials.¹¹

Thus the Robinson-Patman Act safeguards discrimination by uniform prices despite varying costs. This obviously means varying profit margins among the various kinds of customers, and pressure to evade the Act, particularly by suppliers who are small and do not have high antitrust visibility.

Of the price discrimination which does take the form of price differentials, it is obvious that some represents the breakdown of noncompetitive price structures, and is desirable if more competition is the objective; but the law has no exception for the irregular discrimination that promotes competition; no attempt is made to judge the impact on competition in the market, only on the fortunes of individual competitors. But where a seller discriminates between two or more customers, even if it is clearly a stable and monopolistic system, he may escape by showing that the customers do not directly compete with each other as re-sellers. The Act is therefore an attempt to block vertical integration in marketing, and those kinds of price differentials—discriminatory and non-discriminatory—as would arise under active competition. But a buyer or seller may integrate still further, by absorbing the next stage, in order to avoid the discrimination imposed by the Act.

The Robinson-Patman Act, like the fair trade laws, is therefore protectionist legislation, avowedly passed to keep people in business whether they are needed there or not. And it was noted previously that the Sherman Act itself never had been free from protectionism of the same type. The most important question, therefore, is whether these two opposing concepts, of competition and protectionism, will continue their confusing

¹⁰ Federal Trade Commission, *Final Report on the Chain Store Investigation* (Washington, 1934) contains an unreliable summary of the data in its own underlying studies.

¹¹ See M. A. Adelman, *A & P: Price-Cost Behavior and Public Policy* (Cambridge, 1959), ch. 8; *Report of the Attorney-General's Committee to Study the Antitrust Laws* (Washington, 1955), ch. IV.

non-peaceful co-existence, or whether one will prevail over the other.

Law is made by the courts and ultimately by Congress. As concerns the courts, the area to watch is the Anti-Merger Act (Section 7 of the Clayton Act, amended in 1950). The great bulk of complaints issued thus far have attacked as illegal the "competitive advantage" allegedly gained by the merger. Economies of scale are to be declared illegal. But complaints only begin lawsuits; it costs the draftsman nothing to add this language; it remains to be seen how this latest form of protectionism will fare in the courts.

As for Congress, my prediction is at least moderately on the pessimistic side, largely because of the attitude revealed over the past few years. First, there is the long and growing list of industries exempted from the general rule of competition. Second, the strong support for fair trade (retail price maintenance): first in 1952 after the Supreme Court emasculated the Federal enabling statute; and more recently, since State courts have taken to invalidating State laws, the near-success of a national fair trade bill in getting out of committee. It is assumed generally that if the bill gets out of committee it must pass; not enough Congressmen can afford to annoy the retailers, and the President will not dare veto it.

Third, there has been the Senate investigation of the automobile industry. Despite a ringing of many changes on the huge size of the companies, and oligopoly in the industry, there was no suggestion of any attack in that direction; the result was legislation which in effect provides that in any local area, the number of cars available for sale shall be as decided by manufacturer or dealer, whichever number is the lesser. The manufacturer will not offer more than he wishes; if he tries to have the dealer sell more than the latter wishes, this is coercion, and actionable at law. Then Congress in 1958 provided that all new cars be labeled with the point of original shipment, thus pin-pointing cars which had been "bootlegged" in from other areas by dealers willing to sell at lower prices. Still not enough, and this year the talk is of stronger legislation. When the "dealer rights" bill was before Congress, it was repeatedly urged, as an argument in its behalf, that the dealers wanted the bill. What was good for the dealers was good for the country; this argument drew no angry rejoinders, not even a reminiscent smile, only the most respectful attention.

Other investigations have pointed in the same direction. A little over three years ago there was a gasoline price war in Northern New Jersey. From the sellers' if not the motorists' viewpoint it was very desirable, but of course utterly illegal, for one of the oil refiners to go around to all the others to persuade them all together to fix the price of gasoline through "fair trade." But a Senate committee rushed into the breach, held hear-

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ings, and fair trade duly arrived.¹² A short while afterward, a small mid-Western dairy was making life difficult for its competitors, large and small alike. This time it was another Senate committee which held the hearings and issued a report which accused, tried, and convicted the offender of violating the antitrust laws.¹³ When, late in 1958, the Federal Trade Commission resolved to make a study of "the integration and concentration of economic power at the retail level of distribution in the food industry," a news item said that the direction of the inquiry would be clearly indicated by a speech given by the Senate's most conspicuous advocate of fair trade before the National Association of Food Brokers.¹⁴ How much or little truth there was in the news report is yet to be seen. It must be said to the credit of the antitrust agencies—quite apart from standards of policy, it is a tribute to their courage—that they have opposed or at least not helped all of the Congressional activities just mentioned. But Congress disposes, and the best we can hope for at present is that they do no more than minor damage.

DISCUSSION: COMPETITION IN THE FOOD TRADE

ROGER W. GRAY

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If anyone is to accuse the two speakers of duopolistic conspiracy, it should be the next discussant, who would presumably know how to make the charge stick. Yet I find that in so far as their topics have overlapped, if they have not followed courses that look mutually agreed upon, they have at least touched the same bases. Each views the changes that have occurred in the structure of the food industry, whether placed under the heading of "vertical integration" or "increased concentration," as being not necessarily inimical to competition. More than this, each seems to be saying that he thinks competition *has* been enhanced and monopoly diminished in these changes. By competition both mean an awesome and relentless force that yields efficiency. Adelman's insistence upon the inseparability of structure and performance criteria comes as a sharp reminder to those who seek to escape analysis by turning to slogans. And Hoffman, with his description of cross-weave competition, suggests a di-

¹² *Gasoline Price Wars in New Jersey*, Report of the Select Committee on Small Business, U. S. Senate, 84th Cong., 2d Session (Washington, 1956); *Petroleum Week*, May 11, 1956, pp. 39-40.

¹³ *Case Study of Incipient Monopoly in Milk Distribution*, Report of the Subcommittee on Antitrust and Monopoly, U. S. Senate, 85th Cong., 2d Session (Washington, 1958), especially pp. 46-50.

¹⁴ *New York Times*, November 16, 1958, p. F-1.

rection by which impressions of competitive behavior may be reconciled with observed structural change.

So much for the broad area of agreement between the two speakers, who also, as befits their separate interests and topics, granted one another territorial security in certain matters. The differences between them show up very clearly as we follow each into his own territory.

Hoffman catalogs some of the changing competition in the food trade, and is content to attribute every item in the interesting catalog to the search for efficiency. He has, in his own words, ruled upon this; I do not object to the substance of the ruling but to the procedure. He goes on to say that it seems to him self-evident that the resulting competition will be different and more effective than that which preceded it. I do not know whether it is more effective or not, so I conclude that it is not self-evident. Elsewhere, Hoffman presents it as his opinion, without supporting evidence, that all forms of competition in the food trade are more intense today than at any time since World War II. We must realize that he studies the food industry from an excellent observation post; he might have realized that we cannot consider his views to be disinterested, and would therefore have liked to hear some of the evidence which he could undoubtedly muster.

Adelman analyzes the *concept* of competition. A convenient way of summarizing his analysis is to borrow Hoffman's stereotype of the economic concept of competition, and observe that Adelman's concept could hardly fit the stereotype any worse than it does. Hoffman thinks that the inadequacy in the economic concept "stems mainly from regarding competition . . . as something apart from the social and economic institutions which condition it." Most of Adelman's paper, and much of his past work, is devoted to the social and economic institutions which condition competition. Hoffman says further that most economists "continue their mathematics and geometry on the basis of the old—and I think very wrong—postulate . . . that the total industry supply curve is the same regardless of the number and type of firms involved." Adelman says that "the adoption of the Common Market by the Six Nations is basically a choice in favor of fewer firms in Europe, larger firms, more competitors in particular markets, and more competition."

DISCUSSION: COMPETITION IN THE FOOD TRADE*

SIMON N. WHITNEY

Federal Trade Commission

Hoffman's "economic determinism," or optimism, implies that the United States, Soviet Russia and France (to name only three) either have,

* These comments are the author's and not those of the Federal Trade Commission.

or are on the way toward, economic institutions ideal for their people. I doubt that the motivations and material desires of Americans, Russians and Frenchmen differ so sharply. Political and spiritual factors must have seriously interfered with the workings of economic determinism. If he means only that some day countries will achieve such institutions, it is a hope, not a philosophy derived from economic history.

At least two forces tend to push large firms beyond the size warranted by technology and mass distribution. Hoffman does not discuss one with which we are all familiar—desire of managements for prestige—but does give a footnote to mergers motivated otherwise than to gain economies of scale. His example is sale of small firms by owners seeking liquid funds for inheritance taxes. An associated motive is just as basic. Owners of a successful small company, whether they are old or young, will gain through merger whenever their desire for financial security, and thus for more diversified and liquid investments, becomes more pressing than that for maximum profit and independence of action. The stability of the publicly owned corporation acts like a magnet on small firms regardless of efficiency considerations.

Supporting his statement that "much of the growth of the leading food companies in recent years has come through internal expansion, rather than by acquisition," the Federal Trade Commission has found that 20 percent of the increased sales of food chains from 1953 to 1958 was the result of acquisitions after 1953, and 80 percent the result of expanded sales through outlets then owned and newly opened stores.¹

Referring to Hoffman's mention of a "most spectacular growth rate" of companies "ranking down from the leading five or ten companies in each food line," I find that the 9th to the 20th producer in 33 4-digit food industries accounted for an average of just 11 percent of shipments in both 1947 and 1954.² Any spectacular growth was evidently through diversification, or, in his words, "adding products to the line."

Estimates that the share of corporate chains in the grocery business has "held steady at about 38 percent" for "several decades," while that of voluntary and cooperative chains has increased to nearly 50 percent, can be challenged. On the basis of Census data, grocery firms with 11 or more units showed an increase between 1948 and 1958 from 34 or 35 to 42 percent of grocery sales, and from 29 to 37 percent of food store sales.

As to voluntary and cooperative chains, *Progressive Grocer* gives 45 percent for 1958, but this may be too high. The FTC has estimated that in

¹ Most figures attributed to the Commission are found in its *Economic Inquiry into Food Marketing: Interim Report*, June 30, 1959.

² Census of Manufactures data for 1947 and 1954 are from *Concentration in American Manufacturing*, Report issued by Antitrust and Monopoly Subcommittee, Senate Judiciary Committee, 85th Cong., 1st Sess., 1957, pp. 196-98. I have excluded beer, wine, liquor and ice.

1958 nearly 48 percent of general-line grocery wholesale sales consisted of sales by voluntary and cooperative wholesalers to their affiliated stores. Sales to non-members bring it to nearly 64. But if the wholesale value of food handled by chain stores—say, close to 40 percent of the national total—is added, these shares drop below 30 and 40 percent, respectively. High estimates for voluntary and cooperative chains may rest on inclusion of the full retail sales of stores which buy much of their stock from unaffiliated wholesalers and of part of the sales of unaffiliated stores which make some purchases from voluntary and cooperative wholesalers.

As for the interpretation, it is not so much that the individual voluntary and cooperative stores have on average increased their share of the grocery trade, as that these methods have spread. By adopting chain-store-type forms of integration, these independents have avoided destruction by the chains.

Hoffman believes that "numbers of competing firms" have not changed much at any level of "processing and distribution." But between 1948 and 1954 the number of single-unit grocery firms dropped by about 65,000. From 1947 to 1954 the number of manufacturers increased in only 11 4-digit food industries, by an average of 126, and decreased in 22, by an average of 147.

He presents only the bright side of the battle for shelf space. True, suppliers may price their products low to induce the supermarket to stock them in hopes of a high turnover. But they may rely instead on offering the food store a wide margin, with perhaps a higher price to the consumer. There are also less pleasant methods by which suppliers can oust rival products; and some store owners do allot space on other criteria than product merit.

I have emphasized the points in Hoffman's paper which I would qualify, and not those on which I agree or am ignorant. I shall do the same with Adelman's.

Competition through "seeking out innovations" is in full swing, but "bidding trade away" from rivals is often mere persuasion that an almost identical product is somehow superior. I wonder also whether many big companies are still driven to the wall by competition. Modern competition, resting on research and advertising, seems to threaten "constant destruction of vested interests" of small firms in particular.

Both speakers agree that it is competition rather than competitors that we should protect. But if "there are no diseconomies of scale," as Hoffman indicates, we will be finding ever fewer competitors. Even economists may one day want to protect competitors as such—first, to avoid monopoly; second, for social and political reasons. For the present, at least, competition persists. Even in automobiles, an extreme example, five companies

are still holding their own. Perhaps it was fear of the Sherman Act that deterred the industry giant from price cutting, but it may simply have thought this would reduce long-run profits. So long as some competitors are still able to make their way in each industry, we can stand on the principle of protecting competition.

Adelman is not happy with the wage-price spiral, mentioning steel. Many believe this industry would do better to cut prices even if it discouraged new investment in its own expansion. But it is significant that its price from 1921 to 1929 or 1936, before unionization, did fluctuate, and showed no upward trend. I am less worried than Adelman about conspiracy through "the public press." A topic like the steel price outlook cannot be kept out of the news. The companies themselves knew without press reports that Jones & Laughlin was not going to be the price leader.³

In the Alcoa decision, cited to illustrate how aggressive competition has been discouraged by antitrust decisions, the Court may not really have meant that a company should be treated as a monopolist if its success came from "building ahead of demand, and trying to improve the art." (Parenthetically, I could not find any criticism of improving the art). The trial court had held that Alcoa had not deliberately seized each good site just before competitors, and the Circuit Court, perhaps to escape denying this conclusion outright, phrased its criticism in a more general, less factual, and economically less defensible way.⁴ I note that Adelman speaks of the doctrine as "anti-social," but elsewhere, on a point where he agrees, of the Judge's "good economic instinct."

I am not so critical of the Robinson-Patman Act as Adelman; few are. The law states only what price is illegal, not what price should be paid. It was written to stop discrimination against small buyers; it did not try to protect large ones. I concede this much—that it can discourage purchases in the most economical quantities. Its authors preferred this risk to the one they were trying to combat.

I would amend the speaker's denial of any connection between monopsony and seller discrimination by adding "necessary" before "connection." The files are full of cases where monopsony has in fact led to discrimination. He suggests that the FTC Chain Store study of the 1930's found "very little" price discrimination, though he did not present his evidence. In any case, the degree of monopsony is greater today than then.

Democracy and human nature being what they are, Congress is under severe group pressure. One member told an economist, at a hearing re-

³ *Administered Prices*, Part 8: 1958 Steel Price Increase, Hearings before Antitrust and Monopoly Subcommittee, Senate Judiciary Committee, 85th Cong., 2d sess., 1958, p. 4490.

⁴ Compare the analysis in *Report of the Attorney General's National Committee to Study the Antitrust Laws*, 1955, p. 60.

cently printed: "If I agreed with all you said, I wouldn't be here 2 weeks. At election time, I mean." Pressure groups do not always win, however. The national fair trade law might pass if it got out of committee; if so, the important point is that it is not getting out of committee. The fate of the current labor union reform legislation may be instructive.

I can illustrate the speaker's point that the antitrust agencies resist these trends. Fair trade in gasoline did arrive in some areas, but the FTC has now charged two oil companies with resale price maintenance. In the Commission's current study of food distribution, its spokesmen have made it clear that it will choose its own topics and make its own findings, though it welcomes information, and suggestions on topics, from any quarter—including Congress, and the experts here today. Our short interim report, written rather hastily to meet a June 30 deadline, is available here. The final report on this first phase of the study will appear later this year. The topic of the next phase has not yet been selected.

SPECIAL STATUS OF AGRICULTURE IN MARKET COMPETITION

Chairman: Henry B. Arthur, Swift and Company

CAPPER-VOLSTEAD AND THE COOPERATIVES¹

FRANK ROBOTKA
Iowa State University

I

THE law relating to agricultural cooperatives has been in the process of evolution since the beginning of cooperative activities.

The legal status of cooperatives has received special emphasis since the passage of federal and state antitrust laws. Cooperatives were legal under the common law prior to the passage of antitrust laws.

While there were a few judicial decisions otherwise, the weight of judicial opinion is that under the common law, farmers had the clear right to associate themselves together in any number, however large, for the purpose of making collective sales of their products or collective purchases of their supplies.²

For many years following the enactment of antitrust laws, doubts existed as to the right of farmers to organize and operate cooperatives. In 1914, Congress passed the Clayton Act, which, among other things, exempted labor organizations and non-stock, non-profit farmers' associations that met prescribed conditions from the provisions of the Sherman Act (1890). In order to clarify the application of the Clayton Act to farmers' cooperatives and to include cooperatives with stock in the exemption, Congress in 1922 passed the Capper-Volstead Act.

Many cooperatives, and people generally, have assumed that as a result of these enactments, farmers' cooperatives have been and are exempt from prosecution under antitrust laws. Although legislators may pass laws, it is not until the courts interpret them that it becomes known what the statutes mean in their practical application.

What, then have the courts said?

The following summary, it is believed, reflects the preponderance of judicial opinion regarding the legal status of farmers' marketing cooperatives under the antitrust laws as of 1927, based on Nourse's³ exhaustive analysis, in which 97 court cases were cited.

¹ Journal Paper J-3723 of the Iowa Agricultural and Home Economics Experiment Station, Ames, Iowa, Project No. 1255.

² Miller, Judge John D., "The Philosophical and Legal Background of the Cooperative Movement in the United States," *American Cooperation*, 1935, American Institute of Cooperation, Washington, D.C., p. 15.

³ Nourse, Edwin G., *The Legal Status of Agricultural Cooperation*, 1927, reprinted

1. Although neither the Clayton nor the Capper-Volstead Acts had (up to 1927) been tested in the U. S. Supreme Court, it appears established that associations of farm business units are a legitimate form of business organization⁴

2. The producers' contracts under which members agree to market products through a cooperative do not violate Section 1 of the Sherman Act. Such contracts must, however, be reasonable.⁵

3. Cooperatives are subject to Section 2 of the Sherman Act on the same basis as other forms of business with respect to their methods and practices.⁶ The Federal Trade Commission has jurisdiction in cases involving unfair trade practices; the Department of Justice has jurisdiction in cases involving restraint of trade and monopoly not involving price enhancement; in cases involving prices, the Secretary of Agriculture is responsible for determining whether or not prices have been unduly enhanced, and if so must take action.

4. Capper-Volstead cooperatives may enter into agreements with other such cooperatives in carrying out any legitimate purpose, but they may not enter into arrangements or agreements with non-cooperative organizations in establishing prices without exposing themselves to action by the Department of Justice.⁷

In 1935, Judge John D Miller⁸ corroborated conclusions 1 and 2 above in the following words:

Without further citation of authority it can now be confidently stated that properly written Federal and state cooperative statutes are constitutional, and that farmers' cooperative selling and buying organizations properly formed and rightly operated are lawful.

Among the cases cited was a Kentucky case⁹ (1928) involving the constitutionality of the cooperative laws of that state and in which the constitutionality was unanimously upheld and the validity of the cooperative membership contract unanimously affirmed.

Apparently this is the first time the U. S. Supreme Court has ruled on a case involving cooperation and its principles. With respect to this case, L. S. Hulbert¹⁰ said: "This case is important not only on account of the

in 1928, The Macmillan Company, N.Y.

⁴ *Ibid.*, pp. 259-60, 261.

⁵ *Ibid.*, pp. 282-283.

⁶ *Ibid.*, pp. 260-261.

⁷ *Ibid.*, p. 261.

⁸ Miller, Judge John D., *Op. cit.*, p. 19.

⁹ *Liberty Warehouse Co. v. Burley Tobacco Growers Cooperative Marketing Assn.*, 276 U. S., (1928), p. 71.

¹⁰ *Summary of Cases and Decisions on Legal Phases of Cooperation*, No. 6, U. S. Dept. Agr., Jan. 1929, p. 8. See also Raymond J. Mischler, *Legal Phases of Farmer Cooperatives*, F.C.S. Bul. 10, Farmer Cooperative Service, U.S.D.A., Jan. 1958, p. 153 ff.

specific proposition decided, but because of the comprehensive implications of the opinion favorable to cooperation."

In 1937, Congress passed the Agricultural Marketing Agreement Act. This act is of particular interest in this discussion because its constitutionality has been established and because the scheme of regulation which it prescribes and the exemption from antitrust laws which it declares were relied on by defendants in the Borden case.¹¹ In this case an indictment in 1938 charged an Illinois cooperative milk producers' association with combination and conspiracy in violation of Section 1 of the Sherman Act. Certain milk distributors and allied groups, a labor union, municipal officials and others were also involved.

The District Court dismissed the indictment. However, the Supreme Court in 1939, in reversing the lower court, held that although the Clayton Act and the Capper-Volstead Act established the right of farm producers to form and operate associations for marketing their products, these acts did not authorize them to enter into agreements or conspiracies with noncooperative groups or others the purpose or effect of which is to restrain trade or commerce.

One authority,¹² in discussing this case, said that until the Borden case was decided it was not clear that cooperatives might not do the latter. He further concluded¹³ that the case "makes clear that acts done pursuant to marketing agreements entered into in accordance with the procedures prescribed by the Agricultural Marketing Act of 1937 to which the Secretary of Agriculture is a party, and acts done pursuant to orders under the Act, . . . do not violate the antitrust laws." He added,¹⁴ however, that the Borden case does not decide ". . . whether a cooperative, which, without entering restrictive agreements with outsiders, engages in self-contained practices affective to restraint or impede the flow of commerce, could be found guilty under any of the existing antitrust laws . . ."

Another authority,¹⁵ in discussing the Borden case and quoting at length from the opinion of the Court said: "It is submitted that the opinion in the case . . . may, therefore, be regarded as establishing the constitutionality of the Capper-Volstead Act."¹⁶

¹¹ *United States v. Borden Co.*, 308 U. S. 188, 60 S. Ct. 182, 84, L. Ed. 181, reversing 28 F. Supp. 177.

¹² McConaughy, Robert K. "The Antitrust Laws and Agricultural Cooperation," a paper presented at the Division Workshop Conference of the Cooperative and Research Division, Farm Credit Administration, Jan. 7, 1941, p. 13.

¹³ *Ibid.*, p. 14.

¹⁴ *Ibid.*, p. 15.

¹⁵ Mischler, Raymond J., *op. cit.*, p. 176.

¹⁶ It would seem that the opinion rendered by the U. S. Supreme Court in the Kentucky case (footnote 9) might also carry some such implication in view of the manner in which both the Clayton Act and the Capper-Volstead Act were cited. (See excerpt of this opinion previously quoted.)

In any case, the prosecution of cooperatives on charges of violations of antitrust laws has not ceased. Only a few additional such cases which have come up for action during the present decade will be mentioned, each illustrating one or more points of particular interest. These cases were abstracted from the series of publications issued by the Farmer Cooperative Service of the U. S. Department of Agriculture under the title "Summary of Cooperative Cases." The footnote references give the serial number and date of the summary in each case.

Federal Trade Commission v. Florida Citrus Cannery Cooperative, Docket No. 5640, July 14, 1952.¹⁷ This case involved a charge of discriminating among customers in prices on canned citrus juice in violation of the Clayton Act as amended by the Robinson-Patman Act of 1936. The FTC issued a cease and desist order. This case suggests that cooperatives are subject to the Robinson-Patman Act.

Federal Trade Commission v. Florida Citrus Mutual, Docket No. 6074.¹⁸ In 1952 the cooperative was charged with using methods and practices in violation of the antitrust laws. In May, 1957, a final order was issued: (1) approving the cooperative's supply adjustment program designed to relieve or prevent market gluts; (2) approving the right of the cooperative to contract with any purchaser concerning prices to be paid grower-members; (3) denying the right of the cooperative to control prices or interstate shipments after grower-members had sold the fruit to handlers or processors.

Cape Cod Food Products, Inc., v. National Cranberry Association, et al., 119 F. Supp. 900.¹⁹ This is a U. S. District Court case. Action was brought by the food products company against a group of individuals and corporations, including the National Cranberry Association, a cooperative, for damages alleged to have been sustained because of a conspiracy to violate the antitrust laws. Apparently the allegation was that the defendants used their power to make and foreclose loans in a manner and with the intent to eliminate the food company as a competitor.

The jury returned a verdict in favor of the plaintiff for \$175,000 single damages, but some of the defendants, including the NCA, were exonerated. This case is not fully reported. The judge's charge to the jury, however, included comments of special interest to cooperatives:

... There is nothing unlawful under the Sherman Act or any other antitrust act in trying to get even 100 percent of the market through skill, efficiency, superiority of product, or like entirely laudable steps.

On the other hand, this does not mean that percentage figures are entirely

¹⁷ Summary No. 55, Dec. 1952.

¹⁸ Summaries No. 56 and No. 60 and Legal Series No. 2, U.S.D.A.

¹⁹ Summary No. 60.

irrelevant. . . . An increasing percentage and a very high percentage of the market may invite much more careful scrutiny than a small percentage. . . .

United States v. National Cranberry Association. Civil No. 55-418-3, D. Mass., October 28, 1957. In 1955, the NCA,²⁰ two of its officers and two other firms, were indicted in U. S. District Court (Mass.) for violation of Sections 1 and 2 of the Sherman Act. The complaint set forth a number of methods, practices and activities in the conduct of which the defendants were alleged to have combined and conspired and the effects of which were said to suppress competition, exclude other processors, establish arbitrary prices and reduce the amount of cranberries and their products.

On October 28, 1957,²¹ the court and the defendants agreed on a consent judgment in which the NCA and the other defendants were enjoined and restrained from the continuance of a substantial list of methods and practices, the major emphasis being on methods and practices affecting prices and competition.

*United States v. Maryland Cooperative Milk Producers, Inc., and Maryland and Virginia Milk Producers Association, Inc.*²² This case is of interest particularly because it is the first case in which a court has passed upon the question of whether or not two cooperatives could legally fix prices by acting jointly. The two cooperatives were charged with unlawful combination and conspiracy to fix prices in violation of Sections 1 and 3 of the Sherman Act. On October 16, 1956, the U. S. District court for the District of Columbia granted a motion of defendants for acquittal.

Mr. Mischler,²³ in concluding his discussion of this case, said:

It is well to remember that this is a district court decision in a criminal case and may not be subject to appeal. It is not binding on any other court or on the Department of Justice except in the jurisdiction of this court. . . .

A few excerpts from the court's opinion are of special interest.²⁴

It is well established that an agreement to fix prices is, in and of itself, an unreasonable restraint of trade and is illegal, per se, and therefore violative of the Sherman Act.^{***} The question presented here, however, is whether the defendants in this case are exempt from this broad rule.^{***} Section 6 of the Clayton Act is pertinent to the question involved in this case.^{***} The Government argues that the exemption contained in the Clayton Act does not apply to a combination of two or more agricultural cooperatives and urges that such a combination is within the rules of the Borden case.^{***}

This Court is of the opinion that this contention cannot be sustained. . . . The exemption should be construed as applicable to a group of farmers irrespective of whether they are joined into a single cooperative or into several co-

²⁰ Summary No. 64.

²¹ Legal Series No. 4, U.S.D.A.

²² Summary No. 69.

²³ *Ibid.*, p. 6.

²⁴ *Ibid.*, pp. 2, 3, and 4.

operative associations acting jointly. Any other construction would result in partially defeating the intent of the Congress and frustrating the meaning of the Act.

Virginia Excelsior Mills, Inc., v. Federal Trade Commission. F. 2d (No. 7590, decided June 4, 1958.)²⁵ The Virginia Excelsior Mills, Inc., and 12 other manufacturers of excelsior conducted certain activities through a joint sales agency. Their activities included fixing prices according to grade of products, allocating customers and limiting individual production and sales. The Commission chairman ruled against the group on the ground that "agreements to fix prices are unlawful per se."

In June, 1958, the U. S. Court of Appeals, Fourth Circuit, sustained the Commission's findings as to price fixing. However, the court said, "... there is nothing unlawful in such an arrangement where each producer preserves and exercises independence in pricing, acceptance of orders, production and other material matters." The other activities complained of in this case were held to be in violation of Section 1 of the Sherman Act, and consequently, unlawful under Section 5 of the Federal Trade Commission Act.

The decision in the above case is at variance with that in *Appalachian Coals, Inc., v. United States* (288 U. S. 344 (1933)), and in the case of the two dairy cooperatives in the Maryland-Virginia area previously discussed.

United States v. Maryland and Virginia Milk Producers Association, Inc. U.S.D.C. for D.C. Civil No. 4482-56.²⁶ This case should not be confused with the case previously discussed involving two dairy cooperatives operating in the Maryland-Virginia area.

The court in this case summarized the complaint under three charges or counts: (1) an attempt to monopolize interstate trade; (2) entering into a contract (combining and conspiring) with a non-agricultural organization, specifically with the Embassy Dairy, in a deal to acquire its assets; (3) acquiring the assets of the Embassy Dairy and all of the capital stock of another dairy, the effects of which acquisitions have been or may be substantially to lessen competition or to create a monopoly.

The Association pleaded immunity under the Clayton Act and the Capper-Volstead Act, and that the Secretary of Agriculture had jurisdiction with respect to one of the activities complained of.

The court held: (1) That the Association was entitled to exemption under the Clayton Act and the Capper-Volstead Act and could not, therefore, be prosecuted by the government on the alleged monopoly charge under Section 2 of the Sherman Act. (2) That the Association was subject to Sections 1 and 3 of the Sherman Act with respect to the alleged

²⁵ Legal Series No. 6, U.S.D.A.

²⁶ Legal Series No. 7 and No. 8, U.S.D.A.

conspiracy with others not engaged in agricultural pursuits (in line with the decision of the U. S. Supreme Court in the Borden case). (3) That the Association violated Section 7 of the Clayton Act in acquiring the assets of the Embassy Dairy, the effect of which substantially lessened competition. The Association, however, was not held in violation of this section in acquiring the stock of another dairy company which was on the brink of bankruptcy, the acquisition of which, therefore, did not tend to lessen competition. (4) The contracts by which the Association acquired the assets of the Embassy Dairy "were and are in violation of Section 3 of the Sherman Act."

Regarding the immunity accorded agricultural cooperatives under the Clayton Act and the Capper-Volstead Act, the court said, in effect, that the question of how far such immunities extend "has not been definitely determined and is still open." The court said, however, that the exemptions of both acts apply not only to the existence of agricultural cooperatives but to their operations and activities.

In reply to the government's argument that the exemptions and immunities from antitrust laws accorded agricultural cooperatives should be deemed to extend only to certain types of restraints, the court said:²⁷

To say that it should extend only to reasonable restraints would be fallacious because no legislation was necessary to permit reasonable restraints of trade. They are not banned under the antitrust acts. Consequently, if any restraints are immune from the antitrust acts as a result of the legislation we are considering, they must be *unreasonable* restraints of trade. (Emphasis added).

The court went on to say that there are well recognized limitations to the exemptions and immunities. They are conferred on agricultural cooperatives. Such cooperatives may not conspire with others who are not producers of agricultural products. The exemptions extend only to provisions of the antitrust laws and not to other statutes. They extend only to activities involving agricultural products.

With respect to the contention of the Association that only the Secretary of Agriculture has jurisdiction, the court said, without elaboration, that the defendant is subject to the jurisdiction of the Federal Trade Commission and is, therefore, subject to Section 7 of the Clayton Act.

This case has been appealed to the Supreme Court, where it is pending at this writing.

That brings us up to date, I believe.

II

Only a few of the more important cases have here been cited and in very brief form. An adequate understanding of the significance of any case

²⁷ Legal Series No. 7, p. 49, U.S.D.A.

requires an intimate knowledge and careful analysis and appraisal of all of the circumstances involved in the case and of the reasoning of the court. It is believed, however, that the material presented is adequate to indicate the general direction of the judicial winds and to some extent their force, which should provide a basis for drawing some logical inferences regarding their bearing on cooperatives at least for the present and probably for the near future.

On this basis it is in order briefly to summarize the writer's impressions as to what, if anything, has transpired during the past 30 years that might add to or detract from the summary presented earlier of Dr. Nourse's analysis.

1. The right of farmers to combine in cooperative associations has no doubt been more firmly established.

2. The legality of properly drawn and reasonable membership contracts has not been successfully challenged.

3. The constitutionality of the Clayton Act and the Capper-Volstead Act as a specific issue has not yet been tested in the United States Supreme Court. However, there is probably a better basis now than in 1927 for believing that if so tested they would probably be declared constitutional. The Agricultural Marketing Act, however, has been held to be constitutional.

4. That cooperatives are subject to the Sherman Act, the Federal Trade Commission Act, the Robinson-Patman Act, as well as to Section 7 of the Clayton Act, seems to have been established.

5. That Capper-Volstead cooperatives may enter into agreements with each other and to establish common marketing agencies for any legitimate purpose has been reaffirmed. It has also been reaffirmed that such cooperatives may not enter into agreements with non-cooperative or non-agricultural groups without exposing themselves to action by the Department of Justice.

III

The theme of this conference has to do with the "Special Status of Agriculture in Market Competition." A few comments may help tie this discussion to that theme.

Are cooperatives hampered? Agricultural cooperatives are the farmers' means of overcoming many of the disadvantages of their small scale production units and of taking advantage of the economies of large scale marketing operations and of vertical integration. In these respects farmers are striving to make the adaptations necessary to enable them to function more effectively in the market economy—it should be said, in a rapidly changing market economy.

Because of such changes, and changes within agriculture, many changes

may be necessary in state cooperative laws, membership contracts, articles of incorporation and by-laws and in the organizational, financial and managerial structures of cooperatives, if they are to continue to be most effective in the future.²⁸

Interest here, however, is centered on whether or not farmers are unduly or unjustifiably hampered in their legitimate efforts by the status of their cooperatives under the antitrust laws. The Department of Justice and the Federal Trade Commission may feel that cooperatives already have "too much rope" in this respect. On the other hand some cooperative leaders apparently feel that they are unduly restrained or that the growth and development of cooperatives is deterred by the uncertainty of potential prosecutions.²⁹

The court in a case here cited declared that farmers are free to concentrate 100 percent of their production in cooperatives or federations thereof. Mischler³⁰ says:

In this connection, it will be remembered that the Capper-Volstead Act permits an association meeting its conditions to have a complete monopoly in the handling and the marketing of the agricultural products with which it is concerned, and if this monopoly is obtained by proper means, it is consistent with law.

He added that if the cooperative unduly enchances prices it is subject to action by the Secretary of Agriculture.

Certainly, the conditions cooperatives have to meet to qualify as Capper-Volstead cooperatives do not constitute a hindrance. In fact, they may be too liberal.³¹

Some cooperatives may insist that the term "proper means" is being construed by the courts and the Federal Trade Commission in a manner that is too restrictive.

In the Maryland and Virginia Milk Producers Association case, previously cited, the District Court ruled that the acquisition by the Association of another dairy firm was unlawful under Section 7 of the Clayton

²⁸ See Phillips, Dr. Richard, "A Modern Concept of the Economic Structure in Cooperative Associations," paper presented at the joint Extension and Research Workshops on Cooperation, August 1959, at the University of Illinois, Urbana, Ill.

²⁹ A bill (S 2014) designed to remove some of such uncertainty is now pending in Congress.

³⁰ Mischler, Raymond J., *Legal Phases of Farmer Cooperatives*, F.C.S. Bul. 10, January 1958, p. 172.

³¹ With respect to the Capper-Volstead Act, Nourse has said: "In contrast to the Clayton Act, this measure laid less stress upon the recognition of a strictly defined type of association which would be excluded from the operation of laws aimed primarily at abuses which had been found to be rather specifically characteristic of the profit-seeking corporation. To be sure, the Capper-Volstead Act is made to apply only to certain associations, but they present a very 'loose construction' of cooperative doctrine." (*Op. cit.*, pp. 254-255.)

Act. The acquisition was declared unlawful apparently not because it was an acquisition but, in the opinion of the court, because the effect of it was unduly to lessen competition and to tend to create a monopoly. Probably most cooperatives, initially or later, acquire existing facilities. Every such acquisition necessarily has some effect on competition. Considerable uncertainty exists as to just when competition is lessened "substantially" enough to render the acquisition unlawful.

The situation just discussed is merely an illustration supporting a statement made earlier that the legal frontier in the cooperative field is not quiescent. It is not possible to generalize regarding whether or to what extent cooperative progress is being retarded by the status of cooperatives under antitrust laws. It is exceedingly doubtful that cooperatives are being discriminated against in this respect. The situation and needs are quite different in different agricultural commodity fields. Penetrating research studies are needed in this area.

Perhaps too much stress is being placed on the antitrust aspect. Tremendous opportunities for cooperative developments remain unexplored in areas which do not involve antitrust hazards.

Nevertheless, if farmers in the future are to achieve a position where they can to a much greater extent rationally "administer" the different agricultural commodity fields, they will have to achieve progressively more and more power through organization. As they do so they must expect to be subjected to judicial review from time to time. If they do not reach that point, it may be construed as evidence of a lack of vitality, enterprise and aggressiveness on their part.

A number of specific questions are suggested for discussion:

1. To what extent and by what means can agricultural cooperatives control production or market supply?
2. Should marketing cooperatives restrict their activities to the performance of the usual marketing functions and leave the adjustment of production to the government or to some other type of farmers' organization?
3. How far may cooperatives legally go in efforts to bring about "orderly marketing"?
4. May farmers establish or bargain for prices by joining labor unions?
5. In specific commodity fields, to what extent may farmers put power into their bargaining, and by what means?
6. In the future, may not the Agricultural Market Agreements Act and schemes similar to those provided by the California market prorate plan play a much more important role?

Maybe the discussants will provide answers to these and many other similar questions that might be raised.

This paper may appropriately close with emphasis on Dr. Nourse's³² concluding statement in 1927:

Obviously, different commodities with different productive and trade organizations at different times and in different places will present problems of the greatest difficulty to even the best-intentioned official. There is a demand for careful scientific analysis of these several organizations and their problems. The present volume has attempted nothing beyond showing the evolving nature of co-operation as a modern economic institution. How this institution is actually being applied in particular branches of our agricultural industry . . . constitutes another, a larger, and an indefinitely continuing field of study.

This statement is even more pertinent today than it was in 1927.

³² Nourse, Edwin G., *op. cit.*, p. 439.

THE MARKET COMPETITION ASPECTS OF PRICE SUPPORT AND PRODUCTION CONTROL PROGRAMS

JESSE W. TAPP AND JOHN A. HOPKIN

Bank of America

The Issues

OUR assignment is to discuss the *nature*, the *objectives* and the *effects*—in terms of deviations from a competitive market structure—of our major price support and supply control programs. The nature and objectives of the programs as means of modifying normal competitive forces are well known. There is less agreement about their effects although the inventories of farm products, which the government has accumulated as a result of its continuous price fixing efforts, are an ever present reminder that the farm problems of the government are now in a very real sense quite as troublesome as are the farm problems of the farmers.

For decades the adjustment problems of agriculture have been very real and very troublesome. There is no implication here that governmental intervention or assistance has been unwarranted in terms of generally accepted norms. Nor is there any moral connotation in this presentation. The word "monopoly" is used in its naked technical sense with no normative content whatever. The real issue here is the impact of price fixing and production or supply control programs which have been attempted as a means of diluting market competition in the food and agricultural industries.

The ambivalence of government

In recent years, there has been a marked expansion in the efforts of the federal government to "maintain competition" in the food and agricultural industries. The basis for the present Federal Trade Commission inquiry into the distributive trades of the food industries is one example. Reference to any trade journal will clearly indicate the immediate and pressing importance of these government activities. In contrast with this kind of action, the Federal Government—and in lesser measure the states—have for several decades carried on massive and highly expensive programs designed clearly to limit or destroy competition at the farm level and perhaps in consequence adversely to affect the maintenance of competition at the processing and distributing levels. There is obvious inconsistency among these activities in goals, methods, and effects.

The interest here is not to explore or analyze this ambivalence in govern-

ment policies. Rather the purposes are to consider the nature of these massive, comprehensive and continuous government programs, to appraise their impact on the competitive structure of business in the American agricultural economy primarily at the farm level, and to a lesser degree the supply, processing, distributing, and consuming segments.

The hypotheses

Despite the ambivalence of government policy, the price support and related production and supply control programs are attempted monopolistic devices at the farm level, which would involve anti-trust prosecution if undertaken without the sanction of government. Hence, the programs can be analyzed within a monopoly framework with respect to intent, methods, limitations and their likely effects. Unfortunately, there is yet no real knowledge of the facts of income transfer or redistribution incident to these programs.

Economic analysis of the governmental farm price support and production control programs in relation to the usual concept of "market competition" suggests a number of hypotheses, some proved by experience and some derived from the logic of economic theory.

1. All of these programs—both state and federal—are simple and classical monopolies in intent, in methods of operation, and in the limitations which impinge upon them.
2. There are no real conceptual or structural differences between these governmental monopolies and those which have been alleged to exist in the private economy.
3. The operating differences between government and private monopolies are in the main attributable to size, and especially to the greater power and Treasury of the Federal Government.
4. In consequence, there are some differences in the effects of government monopoly at the farm level and at other functional levels.
5. Monopolies enforced and supported by government appear to have no greater capacity for long-run survival than those that have been stated to exist in private business.

The frame of analysis

Most governmental programs for the support of farm prices and the control of farm operations can be described and analyzed as simple Marshallian monopolies. Insofar as these programs achieve their objectives, they limit the amount available for sale in primary channels to a lesser quantity than that which would be available under free competition. Similarly, insofar as they are effective, they raise the prevailing price in primary commercial channels to a level higher than that which would

have prevailed with an atomistic structure free of the intervention of government. State and federal support and control programs specifically provide antitrust exemption. On this issue the record is quite clear, and so are the reasons.

None of the programs aims toward a precise monopolistic maximization of income. The general goal and the governor of most of these programs is some percentage of some parity price. Yet the explicit intent is a transfer of income to farmers, and the methods of income transfer are monopolistic.

The devices

The programs can be classified operationally into two groups. Those exemplified by marketing agreements and orders in general authorize or require the sale of a smaller quantity than that which would move under atomistic competition and yield a consequent rise in the prevailing price. The second device involves specification by government of a minimum price level in primary channels and the transfer of unsalable supported products from commercial channels to government stocks. These programs involve the same type of transfer of income from consumers, but they are also buttressed by direct or indirect payments from the Treasury. In short, both classes of supply manipulation are supported by the authority and the purse of government.

The collateral programs

All supply or price control schemes are afflicted with inherent limitations requiring supporting or collateral activities in order to maintain a reasonably stable control position over time. All monopolies, whether government or private, run the risk of a decrease in demand for the regulated products if their prices are raised relative to those of commodities which are substitutes either in demand or production. Secondly, if output elasticity for the controlled products or their substitutes exceeds zero, as is always nearly the case, then an increased output or volume of sales over time is inevitable. This second difficulty engenders the typical monopoly problem of precluding entry over time.

Thus in response to the first limitation, government has developed such collateral and supporting devices as Section 32 and the massive dumping programs required to counter the inevitable decline in demand resulting from monopolistic price fixing. Parallel to this is an equally impressive battery of government programs designed fundamentally to limit entry. The Section 22 programs are examples. However, the major entry-limiting mechanism is to limit the amount of certain inputs—usually land—which may be devoted by individual farm enterprises to the production of the

controlled commodities. These programs have failed to attain their major objectives for one obvious reason. Not all of the input factors are limited, and as land is limited the amounts and proportions of other inputs are still subject to the entrepreneurial discretion of the individual farm. The farm business remains independent and competitive in outlook except with respect to the controlled input factors or to the sale of particular commodities specified directly by statutes.

Private vs. public monopolies

As indicated, all monopolies have the same motivation, they use the same basic methods and they are subject to the same basic limitations. Government, however, is in a substantially superior position with respect to developing and maintaining monopolies from among numerous, otherwise independent, producers. It can enforce by law the inclusion of the total supply of the commodity in the monopolistic arrangement. Government can tax its people to compensate for the inevitable shifts in demands. It has the authority and funds to try to limit the inevitable supply response associated with successful monopoly. Thus government can and has overcome some, but by no means all, of the difficulties afflicting the old-line private monopolies. Government can require universal participation in an effort to defeat the inevitable tendency of the individual enterprise to evade the monopolistic arrangement, to let his colleagues carry the umbrella or, once in, to get out. Government can require mandatory participation and invoke penalties for violation.

Monopolies which do not completely destroy the profit-identity of participating firms are inevitably unstable. In order to maintain a price-support objective, individuals must be limited with respect to their output or sales. The very specification of the price support or the development of the collusive limitation over sales or over a single input engenders a strong impulse on the part of each individual firm not to *decrease* his own production or sales as is required to make the monopoly effective, but rather to *expand* them. In this sense—along with the use of the Federal Treasury to support the effects of demand shifts—government monopolies seem to work more effectively than the allegedly private ones. Nonetheless, they are inherently unstable. They have not really been able to defeat the atomistic counter adjustment of individual participating farms; they have not successfully countered shifts of demand; and most important they have not achieved the one real necessity of effective monopoly—limitation on expansion of total output.

The Scope of the Monopolies

No long analysis is needed with respect to the importance of these

monopolies in the American economy. The food and agricultural industries are a major part of the total economy. These programs have been in almost continuous use for nearly three decades, and their influence has spread to almost every producing area of the American agricultural economy. While no real analytical information is available, there must have been important indirect effects of these producer-monopolies upon the other functional segments of the agricultural economy. Furthermore, the direct costs involved in dumping or in limiting entry through collateral programs have been astronomically high. Here again, there is no precise accounting or authoritative analysis. But perhaps more important, the indirect costs of the distortion of economic allocation and sales limitation have not even been considered, let alone analyzed. The effects of these programs upon agricultural enterprises, industries and markets, with respect to the controlled enterprises, and to the suppliers, their competitors, processors, and consumers are automatically effects upon major sectors of the national and world economies.

The Structural Effects of Monopoly

If monopolies are at all successful they must have a direct structural effect on the enterprises directly controlled, and, consequently, on their suppliers, their customers, their competitors not subject to control and upon a series of related industries.

The participating enterprise

With respect to the controlled inputs or the controlled volume of outputs or sales, in effect a large number of small and competitive enterprises become one single monopoloid firm. Authority to make certain decisions with respect to these controlled variables is removed from the private competitive firm and transferred to government. Atomistic competition *remains* with respect to all other determinants of the individual farm profit account.

Thus, the implicit and fatally deficient assumption with respect to the input-control programs is the belief that output can be reduced from the competitive level to an amount that will sell at the specified support price solely by limiting one major input factor on all farms. It is assumed that this limitation applied to all individual enterprises would result in a total volume of output compatible with long-run maintenance of the monopolistic price support. Effective monopoly operation is limited by the fundamental instability of any partial monopoly and also by the difficulties of administration, allocation, financing and enforcing of such large-scale controls. More important is the inability even of the Federal Government to eliminate atomistic adjustments and private profit viewpoints of the

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individual farm with respect to their other input factors aside from land. There is a natural tendency by individual farmers to adjust the nature and amount of their other inputs so as to maximize their outputs under the constraint of the fixed land input at a known price support. This is a crippling deficiency from the operational standpoint of a good monopolist.

Where sales rather than inputs are controlled, the difficulty afflicting individual entrepreneurs is the inevitable tendency to *increase* their individual output or sales in response to an enhanced price whereas the success of the program requires a *decrease* in individual output or sales. This is why government must use its police power to punish violations as well as its treasury to induce compliance. In these types of monopolies, the individual farm really loses the right to make only one decision—the amount of sale it is permitted to make. Against this, it is always induced by the program itself to increase its sale or output. The entrepreneurial viewpoint and counter adjustments of uncontrolled profit determinants are unrepentantly atomistic. These are the primary reasons for the failure of such monopolies in the absence of continued and forceful intervention by government.

The lessons

Government monopolies in agriculture, like any other similar arrangement, result in only partially monopolized individual enterprises. Where only one or a few input factors such as land are regulated, the individual enterprise is *automatically* induced to expand its output by adjusting other input factors. This tendency is fortified by the known artificial support price. The lesson is simple. For government effectively to operate an efficient monopoly, it would be required completely to destroy the entrepreneurial identity of the participating firms and to control every one of its profit determinants. Up to this point, at least, it has either been unable or unwilling to take this step which might have rendered these monopolies efficient as monopolies even if inefficient by any other criteria. Nor are there any indications that farmers would tolerate such a complete surrender of their management function to such total governmentalization—even if somewhat higher returns could be foreseen.

Effects on farms

There has been discussion over the past decade of the efficiency implications at the farm level of these programs. Relative prices of the supported commodities may, in fact, have been higher than they otherwise would have been. Proponents of the programs argue that they have raised farm income. We really don't know whether or not this is true, although it likely is—assuming about the same kind and quantity of goods would

have been produced in both instances; however, this assumption seems unreasonable. Without such programs resource and output shifts might have been sufficient to have resulted in an even higher farm income than actually was realized under the programs. Unfortunately, direct and indirect income transfers remain unmeasured and there is no compelling analysis of what might have occurred without these monopolies.

As a consequence of having restrictions imposed on single inputs, the relative profit alternatives from different input combinations have undoubtedly been distorted. Furthermore, the relative volume, timing and product allocations may well have differed from the magnitudes which would have yielded, at least in terms of consumer interest, a more desirable economic structure.

The capitalization of monopolistic values of relatively fixed allocations may have meant that only the original participants in these monopolies have really enjoyed enhanced income through these devices.

Effects on suppliers

There is no measurement of the net effects of the programs upon the operations of enterprises that supply inputs to farmers. Both the input control and the supported price are determinants of the productivities of all of the inputs going into a farmer's business and, therefore, of the demand for inputs. Accordingly, demands for inputs by farmers must have been affected in some way yet unmeasured.

Clearly, the general failure of these government programs really to control output indicates that the quantity and quality of other inputs can be varied by these partially monopolized individual farms when price is specified and when land is limited but no controls are placed over other profit determinants. Acreage allotments and price supports combined have almost certainly stimulated the demand for fertilizers, insecticides and a host of output-increasing techniques, perhaps at the expense of factor-saving innovations. With either market or sales control, similar distortions of the demands facing suppliers and the market channels through which they must move should also be expected, although no real or definitive analysis of these possible effects seems yet to have been made.

Effects on handlers

The likely effects of farm-oriented, government control programs on handlers or processors of farm products seem to have received little attention. Shifting production from one region to another through the programs has both efficiency and income effects upon processors and handlers as well as upon producers.

In some cases, the raw products are sold out of first hands under a

monopolistic arrangement. In other instances, no such arrangement exists. We simply do not know what modifications are made in the decisions of processors relating to volume, product development, labeling, promotion, and pricing of the several commodities handled when in the purchase of some raw products they face a monopolistic arrangement while other raw products are purchased from relatively competitive markets. We do know that these effects must be particularly important to consumers; however, nothing is really known with respect to the effects on market structure among processors.

Effects on related industries

Again, both logic and experience indicate that these programs have materially influenced the risk-bearing, profit-division and decision-making of such collateral industries as transportation, commodity exchanges, and other marketing agencies, insurance, financing and, in fact, a whole battery of industries related to food and agriculture.

The cotton program is an interesting case in point. Some of the firms and industries connected with the processing and marketing of cotton are confused and demoralized. Others are critically ill. Previously, the uncertainties of the industry were those arising from a variable demand (which is partly amenable to economic analysis and forecasting) and a variable supply (which is associated, in part, with variable weather the effects of which, at least, are impartial). Now the primary uncertainties for many segments of the cotton industry are those associated with changes in legislation or government administrative decision, which often can not be foreseen, are not amenable to economic analysis, and may tend to have discriminatory effects. From the standpoint of the total cotton industry, the hypothesis that the price-support programs have reduced uncertainty and brought stability to the industry seems questionable. This conclusion is strengthened and generalized by the opinions of competent leaders in the marketing of feed grains, wheat and rice.

The market effects

The effect of these programs on the market structure as measured by price, substitution, or entry elasticities facing firms has never been analyzed. Although no one has, as yet, really measured the direction or magnitude of the shifts in demand or supply functions induced by the programs, the following generalities appear reasonable. Supply curves for several of the controlled products and their competitive products seem clearly to have shifted to the right. Demand curves have shifted to the left for some of the products and to the right for competitive commodities. The emergence of these shifts would be expected from theory and has in

fact occurred. The loss of the butter market is not the only case in point; the cotton *vs.* synthetic story is clear also, as is that of domestic *vs.* foreign cotton in the world market. The rice industry is now much exercised because their foreign customers have learned the virtue of soft wheat as a substitute for high-priced rice.

The effect on consumers

The immediate and obvious effect upon customers of partially monopolized farmers is the development of what amounts to a fixed price. Consumption in primary channels is constricted, and price is raised. The direct cost of subsidies is also easily apparent. In addition, the terms, the methods and the channels of marketing must almost automatically have been altered in order to support the administrative, financing and enforcement activities of government with its control programs. Here, again, to our knowledge, no analysis of a definitive nature is yet available. Few quantitatively valid analyses have been made of the possible effects of these partial government monopolies upon consumers; however, if these monopolistic type of programs bite, their effects must be like those of any other monopoly. The total effects on consumption include both a substitution effect and an income effect. No one has really measured the amount, or mechanism, of total income transfer to farmers by means of these programs. Nonetheless, insofar as they have been effective their impact must have been that which is intended in any monopoly.

Effects on income redistribution

The unifying objective of these many programs is to transfer income to agriculture. Therefore, one might reasonably expect that their income effects would have received special analysis and that statistical series would have been developed to measure the incidence of income benefits and costs. This is not true. Moreover, such information as Commodity Stabilization Service payment or other records have not been tabulated and analyzed in terms of the economic and social criteria implicit in the underlying objective.

The problem of who, precisely, in agriculture should be the ultimate recipient of the net benefits of these payments has never been resolved. Inherent in the politics of the programs is the objective of bringing the income of everyone in agriculture up to some socially acceptable minimum standard. While there has been no analysis of the incidence of income benefits, the sharp contrast between objectives and the results is demonstrated in the President's agricultural program message to the 86th Congress, and by recent articles in *Time*, *Fortune* and *U. S. News and World Report* magazines. The proposed introduction of the \$50,000 maximum

might prevent further proliferation of such popular magazine articles but would not modify materially the figures in the President's message. Nor would it affect the poverty problem in agriculture.

As yet, we are much in the dark concerning the incidence of costs of these programs, although it is becoming increasingly evident that consumers feel that the heavy burden of incidence finally settles upon them. To the extent that this view is right, the income effects are likely to be regressive. Estimates of the incidence of benefits and costs of our price-support programs should be very useful in appraising the policies of the past and in adjusting policies of the future so as better to obtain the desired income effects.

The Implications

At the outset of these ambitious government control programs, only basic industries were involved. Basic industries at first were major commodities closely related as major inputs to other processing or distributive trades and involving an export or other bottleneck which would permit effective monopolistic administration. Within a matter of months, basic commodities to which these control devices might be applied became in fact any commodity able to exert sufficient legislative pressure to have itself so designated and therefore qualified to avail itself of these techniques.

Government, once it undertakes market control, must, like any other monopolist, control the *whole* supply in the market; it must, therefore, limit entry; and it must stand ready to counter shifts in demand. Furthermore, it must find means to counter the built-in instabilities of all sustained monopolies which do not completely destroy the entrepreneurial identity of participating firms. Government has been afflicted with the typical difficulties of all monopolies with respect to enforcement, administration, allocations of production or selling rights, relative demand shifts, and the necessities of controlling output. The programs have been massive in scope, but they have not in fact really been successful even if measured simply by the criteria of effective monopoly alone. There is little hope that they could be made successful.

At the farm level, these are only partial monopolies. This is why the counter adjustments by farms have been induced and have been made possible. This is also why there is a continuing tendency to violate. All evidence, both theoretical and empirical over the past three decades, indicates that even government monopolies are ineffective without the virtual destruction of the entrepreneurial identity of the individual farms of the nation. Consequently, they are inherently unstable in a democracy.

Almost surely, these programs have altered market structure in all of

the various segments of the food and agricultural industries. They have beyond doubt created a monopoloid structure at the farm level. How much have they cost, who has benefited and by how much, and how have they affected other parts of these industries? Who really knows?

DISCUSSION: SPECIAL STATUS OF AGRICULTURE IN MARKET COMPETITION

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The Robotka paper takes about 15 pages to make what amounts to a testimonial to the brilliance of E. G. Nourse in the cooperative field—namely, the accumulated experience up to 1959 suggests Nourse was right back in 1927. To this I do not object.

In the last three pages the author gets down to some of the real issues relating to the special status of agriculture in market competition, has no space to develop them, ends with six questions, and states that maybe the discussants will answer them. In the short time a paper is made available to discussants there is not much opportunity to answer one question, let alone six.

The upshot of this is that I have little to say in an analytical way about the Robotka paper. I would have liked to learn about the extent to which Capper-Volstead cooperatives have modified market structures in agriculture, the extent to which these modifications have brought about demonstrable changes in market performance in prices, quantities, qualities, income distribution and the like. I would have liked to hear Frank Robotka's opinion about the possibilities and limitations of Capper-Volstead cooperatives in bringing to agriculture a status that is "special" enough to be about equivalent to that enjoyed by the non-agricultural economy.

The victims of my having the first paper such a short time are the authors of the second paper, who gave me the opportunity to devote a generous amount of time to their treatment.

Despite the warmth of a long-time personal affection and respect for Jesse Tapp and a shorter nodding acquaintance with John Hopkin, I must say their paper leaves me slightly cold. They have chosen a conception of monopoly variously called simple and classical, Marshallian, to be used in a naked technical sense, and state that it describes and can be used to analyze most governmental programs for the support of farm prices and the control of farm operations. The twentieth century version of Marshall's Chapter XIV monopoly is called single firm monopoly. It is a limiting case of competition and specifies a single firm producing a product with no

substitutes and entry restricted absolutely to maintain the single firm identity.

Having said that this model describes and fits the analysis of government in agriculture, they demonstrate most effectively in the rest of the paper that, indeed, it does not. The reasons are demand shifts because product substitutes are not sufficiently remote and supply shifts in both the quantity and schedule sense because the identity and integrity of a single firm controlling supply with restricted entry cannot be established. The authors question whether agriculture has benefited by an income transfer as a result of government and in so doing refute their model because if monopoly described the situation, there would be no doubt about the beneficiary. Quite realistically they point out that none of the programs aims toward a precise monopolistic maximization of income, that the programs have not in fact really been successful, and that at the farm level they are only partial monopolies.

Thus I conclude from their analysis that neither government nor anyone else has a monopoly in agriculture. While this is probably not what they sought to prove, it is a conclusion with which I have no quarrel, and it is well demonstrated.

However, the thing that makes me cool toward the paper is its negativistic orientation.

They have demonstrated that these programs have some looseness on both the demand and supply side (aye, verily, even as does the Bank of America), so monopoly does not fit the picture very well. What, then, is the appropriate model? If the present programs are not successful or effective, what can be done to improve them? Evidently they are not suggesting use of the monopoly model as an analytical device to show how the present programs can be made into effective monopoly because one short sentence says there is little hope in this. Assuming that agriculture deserves or requires special status in market competition, we don't know what the authors would recommend.

Finally, this negativism makes me uneasy. If the present programs are not effective and if they cannot be made effective, logic suggests getting rid of them. In the absence of anything else on the positive side to substitute, agriculture goes back to the free market. Most free market advocates favor striking against monopoly wherever it is found. Our authors, while not saying they favor a free market for agriculture, do state that government in agriculture is monopoly but that monopoly in the private economy is just "alleged." If the thousands of pages of testimony and evidence in Sherman Act, Clayton Act and Federal Trade Commission actions suggest mere allegations of private monopoly, I am concerned about what their public policy recommendations in the field of market competition for the economy as a whole might be in view of their remarks about the ambivalence of government. And I am equally concerned about what their recom-

mendations concerning policy in market competition for agriculture might be.

Despite the foregoing remarks, I must acknowledge that this is a thoughtful and useful paper in indicating the obstacles to using a single-firm, pure-monopoly approach in agriculture.

DISCUSSION: SPECIAL STATUS OF AGRICULTURE IN MARKET COMPETITION

D. O. HAMMERBERG

Federal Milk Marketing Administration, Connecticut

I feel impelled to state at the outset that I see the farm problem in terms which are quite different from those of Mr. Tapp. In order that some of the issues may be joined early, but also to provide a perspective that is more nearly in accord with my own views on this problem, I wish to present a few facts which appear relevant to this discussion.

During recent years, workers employed on farms have comprised about 9 percent of the total of gainfully employed workers. Their share of the national income, in contrast, has been only about 3½ percent of the total. Even after allowance is made for abnormally low incomes in the South, it still is true that the share of the national income going to agricultural workers is very low by any standards. This is especially true when account is taken of the capital and skills required, the length of the working days and weeks, the risks entailed and the nature of the work and the working conditions. A second fact is that the general drift of agricultural prices and incomes has been downward throughout this decade. When an economist speaks of the income transfer effects or the tendency toward price enhancement which may result from the application of monopolistic price fixing practices or curtailment of supply, he means that the income or the price is greater than it would have been (assuming all other factors remained constant) in the absence of the monopolistic devices. To the layman, unfortunately, the use of the terms "monopolistic price enhancement" or "monopolistic income transfer effects" creates an impression which may be quite contrary to that intended and which may, indeed, be magnified out of all proportion to the actual effects. The impression created throughout the United States, I believe, has been that most American farmers have been living off the "fat of the land" and have derived a large part of this advantageous position through monopolistic prices established through governmental intervention or huge subsidies financed by inordinately high taxes.

In view of the general, substantial and persistent downward drift of the

prices for agricultural products, the impression carried would have been more in accord with the facts if the conclusion had been that the price support and production control programs may at best have had some tendency to retard the speed or to reduce the degree of the downward trend. If the price and income enhancement effects of these programs are deprecated on the score that they are the result of monopolistic governmental intervention, the question may fairly be asked: how low, then, do we want these prices and incomes to go?

It is similarly misleading to speak of the increased tax burdens resulting from agricultural subsidy payments without simultaneously taking account of the fact that even though agricultural incomes are low (again by any standard), and have been decreasing substantially, the local tax burden upon those same farmers simultaneously has been increasing by leaps and bounds. They have been increasing to provide public and community services for non-farmers as well as farmers; and they have been imposed with very little regard for the farmers' ability to pay.

I also wish to register some reservations about at least two of the hypotheses advanced by Mr. Tapp: first that "all of these programs—both State and Federal—are simple and classical monopolies in intent, in methods of operation, and in the limitations which impinge upon them"; and second that "there are no real conceptual or structural differences between these governmental monopolies and those which have been alleged to exist in the private economy." For many years prior to the enactment of the Agricultural Adjustment Act of 1933 or the Marketing Agreement Act of 1937, handlers and milk producers had been buying or selling milk in a large number of the major fluid milk markets of this country on the basis of a system of pricing known as "use-price plans" or "class-price systems." Some of these provided for only two classes of use. Class I milk generally included only the milk sold in fluid form by handlers. Class II included the milk sold or used in other outlets. In some markets, however, several classes may have been defined.

There is little doubt that the enhancement of the average returns to producers was one of the objectives sought by producers when they entered into these pricing arrangements, but the objectives included many important considerations other than price. The production of milk is a biological process subject to many vicissitudes. The demand for it tends to be associated with deep-seated nutritional needs and desires. Because of the inelastic nature of both the supply and demand functions (at least in a short run) the unavoidable and sometimes opposing fluctuations which occur, especially from season to season, tended to result in extreme alternate shortages and gluts. These, in turn, under a simple classical model of the supply-demand-price equation, resulted in frequent and extreme fluctuations in price.

In addition, "fixed costs" tended to comprise a large proportion of total costs in milk production. There were large differences between producers and handlers in the degree and effectiveness of organization. The product is bulky and perishable, and seasonal and other variations could not be readily counterbalanced either through storage or through shipments from distant points. Production and marketing were surrounded by elaborate sanitary and quality control regulations which, with or without monopoly intent, affected the nature of the supply function. These characteristics and conditions were the factors which resulted in the adoption of this unique pricing system and in the need for public regulation of the milk pricing and marketing system.

Even from the foregoing cursory description, it should be apparent that the process through which the prices for milk now are established is far removed from the classical simplicity of "supply and demand" economics. The "demand" for milk is stratified; it is broken into segments in which the elasticities of demand—within broad ranges of price—differ substantially.

The supply is also stratified, and again on a use-of-product basis. Hence, from an economic standpoint, the equating of supply and demand in any fluid milk market is effected, not through the establishment or the adjustment of any one single price (the classical model), but through the establishment or adjustment of at least two—and in many markets, several—class prices. The only theoretical economic models to which this process bears much similarity are those relating to discriminative pricing. In these models, however, several simplifying assumptions are made; and in actual practice, sellers seldom or never have such perfect knowledge of the market, or such perfect control over it, that the theoretically ideal conditions can be realized.

In the pricing of fluid milk, the practice departs from the discriminative pricing model in several very important respects. The sellers of fluid milk (i.e., the producers) are not one in number but are numerous. In some markets, a considerable proportion of producers (but seldom in excess of 60 or 70 percent of the total number who supply the market) are organized into a cooperative organization which has a degree of (and often considerable) control over its own price and selling policies, but only—manifestly—over the portion of the total supply which is delivered by the members of that cooperative. Except within narrow limits, moreover, the total quantity which each of those members, and hence all of them collectively, will produce and deliver to the market is not subject to effective control by the selling organization. The selling organization likewise has little or no control over the utilization of the milk, and usually cannot allocate it among the various uses or even among the users, each of whom may be expected to allocate the basic raw product among various uses in accord-

ance with what he believes are *his* best interests, not those of the producers. Finally, the cooperative and its members usually have intended only to enhance returns and not to maximize them. Often, in fact, they were motivated as powerfully by a desire to stabilize the pricing system and the prevailing level and structure of prices and to assure outlets for seasonal or other surpluses as they were by a desire to enhance their returns.

Under the auspices of organized producers and the buyers of their products, we therefore may say that the principle of discriminative pricing (that is, the use-class pricing system) was made to serve the following major objectives: (1) enhancement (but not necessarily maximization) of returns to the organized producers; (2) stabilization of the pricing system and of the structure and level of prices prevailing in the market; and (3) economical pricing and orderly disposition of the surpluses which are the inevitable and necessary concomitant of a biological industry in which both supplies and demands are subject to frequent, unpredictable and uncontrolled variations.

Under public regulation, this unusual pricing system has been given broader scope, being applied for the purpose of assuring: (1) that each market subject to regulation would obtain a total supply of milk which would be adequate at all times to provide that market with its requirements of milk for fluid use (or of the kinds of milk for which special and specific quality standards have been established); (2) to maintain a price for the milk used in fluid form which would be reasonably adequate to compensate the qualified producers of that kind of milk for the extra costs and the more exacting demands imposed upon them for meeting both the quality and the quantity requirements; and (3) to provide for the whole market an equitable price structure and thus an orderly means for the disposal of any milk delivered to that market which is not immediately required there for fluid milk purposes or for any of the other purposes for which special quality requirements have been made mandatory.

In my view, therefore, public intervention in this economic process appears to be needed, and has been established and maintained, not primarily to enhance the incomes of milk producers, although it undoubtedly has had considerable effect in that direction; but also to provide necessary norms in establishing prices; to limit exploitation; to assure equity and uniformity in the product-costs of handlers; to assure equity and uniformity in returns to producers; and finally to minimize uneconomic practices and to encourage or hasten the introduction of economic practices both in the production and the marketing system.

To these we may add the further consideration that the process itself, through the mechanism of public hearings and under the standards estab-

lished in the Act and through the Administrative Procedures Act has provided an orderly means of reconciling conflicting views and interests among the participants. At its worst and in all of the 26 years in which it has been in operation, this process for the reconciliation of conflicting interests stands as an attractive alternative to that which currently is being invoked in the steel industry. Parenthetically, I may also add, this is one of the few price making processes in which the general public has had any opportunity whatever to participate or even to gain accurate and first-hand information regularly and continuously about the facts and issues involved.

For all of these reasons, I submit that there are many and very real conceptual and structural differences—in intent, in methods and in effects—between the price making processes which now are being conducted under governmental auspices in the dairy industry and those monopolistic procedures “which have been alleged to exist in the private economy.” I am less familiar with the other commodity and marketing agreement programs than with that for milk. If these have been conducted with as little justification, and solely for the purposes, and only with the results expressed or implied in Mr. Tapp’s paper, they of course deserve censure. That his strictures are true in part, I do not doubt; that they are the whole or the only truths about them is a hypothesis that leaves me profoundly skeptical.

It seems to me that there are two aspects of the general problem pertaining to “the special status of agriculture in market competition” to which we should address our attention. One relates to the question of how we can accommodate the already high and rapidly increasing productivity of our agricultural processes in the face of relatively inelastic demand without subjecting our farmers generally to the hardships of bankruptcy. I frankly do not believe that any adequate or satisfactory answer to this question is to be found either in “flexible price supports” or in production controls.

The second aspect relates to the question of how we can use these vast and already existing food and fiber resources and this increasing productivity as assets to improve the diets of our own people, to strengthen our position vis-a-vis our antagonists in the world at large, and to improve our relations with and strengthen the position of those who are our friends.

Any or all of these will require massive public intervention, very substantial expenditures and pervasive application of the principles of discriminatory pricing. However, the intent, the methods of operation and the effects of such programs will be quite different from those of simple, classical, Marshallian monopolies.

AGRICULTURAL SUPPORT MEASURES

Chairman: Sherman E. Johnson, Agricultural Research Service

RECENT CHANGES IN BRITISH FARM SUPPORT POLICY

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I

THE title of this paper indicates that the farm support policy we have in Britain does, at least, possess the merit of making changes possible. This is entirely in keeping with the historical fact that the policy we have has been improvised from its beginnings in the 1930's to meet a series of specific "emergencies." In the particular conditions of the British economy there is much to be said for a farm policy based on an element of empiricism.

So far, the only constant feature of our support system is its controlling mechanism—the *annual price review*. This was evolved during the war years and formally incorporated, as a principal feature, into the permanent peace-time structure of the industry by the Agriculture Act, 1947.

The *annual review* is a political process involving formal discussions between Ministers and Farmers' Unions. The discussions are guided by a set of rules and conventions and by a statistical apparatus developed over the years. It is not essential that the discussions should result in agreement, for the ultimate determination of guarantees is the sole responsibility of the Government. While the review is conducted in private, the results are published immediately as a White Paper and they are made the subject of parliamentary debate.¹

The purpose of our support policy is stated in the 1947 Act to be the establishment of stability for agriculture as a whole. Nothing is stated in the Act about the level at which this stability is to be established except that it is to be consistent with "proper remuneration and living conditions for farmers and workers in agriculture and an adequate return on capital invested." The main method of providing this measure of stability is through guaranteed prices and assured markets. Although price-fixing is thus one of the chief means of achieving the main aim of policy, it is im-

* The author received helpful comments in preparing this paper from his colleagues C. H. Blagburn and R. H. Tuck.

¹ These White Papers on the *Annual Review and Determination of Guarantees* have already become indispensable documents for the student of agricultural policy. They set out Government production objectives and policy, and they also contain important statistics indicating year by year the economic and financial condition of the industry.

portant to remember that the aim itself is not to establish stability of prices *as such*. The Act, very wisely, allows considerable latitude in the choice of the specific measures to be used for the promotion of the main aim of reaching stability.

This flexibility has made it possible to introduce three important developments during the past five years, viz.:

- (i) the replacement of forward prices by deficiency payments from 1954 onwards,
- (ii) the introduction of new long-term assurances in 1957,
- (iii) the special provisions for helping small farmers in 1959.

All three developments are, in a sense, attempts to improve the whole machinery of support in the light of experience. But they can also be regarded as part of a general policy designed to loosen up the rigid guarantees of the war and the immediate post-war periods and to open up the industry to a greater measure of economic pressure.

II

For some ten years the specific emergency which dominated our support policy was an absolute shortage of food. To meet it the Government resorted to the control of marketing and distribution and to consumer rationing. During these years the Government purchased directly, or through agencies, all the chief farm products at fixed prices announced in advance. There were doubts on the administrative side as to whether the review system as worked in this period could survive the dismantling of the apparatus of controls and rationing.

In fact the main controls were removed during the year 1953-54, and from 1955 onwards farmers have had to find their own markets. But the review system has continued with the guarantees operating largely through deficiency payments and subsidies based on the difference between the announced standard price and average market prices.

The detailed arrangements, some of them intricate, vary from commodity to commodity. For milk, eggs, potatoes and wool the producers' marketing boards are used as the instruments for giving effect to the guarantees—the boards announce and pay their farmer members a combined price which includes the deficiency payment, thereby simplifying the procedure for the individual farmers concerned. A somewhat similar effect is secured from that part of the fatstock output which farmers choose to sell through a Fatstock Marketing Corporation and certain other channels. Sugar beet is sold under contract to the Sugar Corporation. But for other items farmers receive the deficiency payments separately, after the day of sale, and there is no doubt that they are often obscure as to how much the payment will be until they get it.

The guaranteed prices (except for milk) are minimum prices, and in late years they have been exceeded by market prices for several commodities. With the exception of milk, they all have the common feature of avoiding interference with free marketing in the sense of prescribing a price which must be paid or received in the market place. They, therefore, subject the individual farmer to price variations reflecting quality differences, short-period fluctuations or local variations in the supply and demand position.

This change from guaranteed fixed prices to subsidy payments, has, however, a wider significance. It provides a good illustration of the way in which our support policy has been adapted to the pressure of events. So long as the "food shortage" lasted, a very substantial support bill was politically acceptable since it was, in fact, a "consumer subsidy" as well as a "producer subsidy." By 1953, however, it seemed clear that the prices and availability of our *total* food supplies had moved in such a way as to make a general subsidy of this kind quite indefensible. The case for a "food subsidy" had passed, the case for a "production subsidy" was considered to be still with us.

Once this was accepted it became highly desirable politically that any support payments to farmers should be more specifically directed at the particular aims they had now come to have. The choice of subsidies and deficiency payments as the chief instrument of support enabled this to be done. Support to the farmers has been brought out into the open as an easily recognizable and indisputable item of government expenditure which has to be paid for by the taxpayer. This makes it a political necessity to keep the amount of this item in line with what the electorate can be persuaded is desirable for the purpose.

III

Running true to form, the Government improvised further important modifications of policy in the 1956 White Paper on *Long Term Assurances to Agriculture*. In theory, the new proposals could be interpreted as a device to enable the Government to make a progressive reduction in the level of price support at a predetermined maximum rate. In fact, they provide an assurance to the farmers that the political "buffer" represented by the review procedure could protect them against any sudden drastic cut in the existing level of support. In other words, if there were a really severe slump in world agricultural prices, the Government will not, at least, lack the constitutional powers to shelter British farmers from it.

The 1957 Act, which implements these new proposals, specifies that the total value of all guarantees and grants in any one year shall not fall below 97½ per cent of the previous year's total when adjusted for aggregate

changes in factor costs. Within this total amount, the guaranteed price for each commodity cannot be reduced by more than 4 per cent in any year, and in the case of a livestock product it cannot be reduced by more than 9 per cent in any period of three years.

The maximum permissible total fall of 2½ per cent per annum is an intriguing figure. It is probably accidental that it has recently been estimated that agricultural productivity in Britain has been increasing at the rate of some 2 per cent per annum over the past few years. Be that as it may, the position now is that farm prices, in relation to costs, can be reduced in amounts which could, if there were no other changes, cut about £30 million off the global net income of the industry in any one year. If this were done for any considerable period it would obviously subject the industry to severe economic pressure. In four years, for example, *net* income could be reduced by a third, unless farmers themselves took effective steps to counteract the fall in guarantees.

In practice, during the short period for which it has been operating this policy, the Government has not reduced the value of the guarantees by the maximum possible amount—which is about £30 million before allowing for changes in costs. In 1957 factor costs increased by £38 million and the lower limit for the Government's determination was therefore an *increase* in the value of the guarantees of £8 million. In fact, the guarantees were increased by £14 million, which was £24 million less than the increase in costs. In 1958, when factor costs increased by only £11 million, the guarantees were reduced by £19 million, which was nearly the maximum permitted. In 1959, on the other hand, whereas the factor cost increase of £11½ million was about the same as in the previous year, the guarantees were not reduced at all but were increased by £3 million, i.e., £8 million less than the increase in costs.²

The trend of aggregate net income in these three years is shown by the following series of official estimates:

1956/57	£339 million
1957/58	£355 million
1958/59	£360½ million

Thus in the two later years the industry appears to have absorbed cost increases of £49 million and a net reduction in the value of the guarantees of £5 million, and yet its net income has increased by £21 million.

These long-term assurances, taken in conjunction with the previous change from fixed prices to deficiency payments, have had one unfortunate result. Together they have tended to make the whole process too complex to be readily understood by the general run of farmers. Probably only a

² The disastrous weather of 1958 may have led the Government to soften the blow in 1959, and the shadow of an approaching general election was also, possibly, a factor.

minority of farmers can grasp the arithmetic used for implementing the new long-term global guarantee. More importantly, the complexity involved in making deficiency payments for several commodities has lessened the attention paid by many farmers to the guarantee announcements, thereby depriving those announcements of a part of their point, and lessening the influence they should have in stabilizing and guiding production.

IV

The scheme for giving special assistance to small farmers, announced in October 1958, is the most recent example of the process of linking support payments more specifically to the aims they have now come to have. One of these aims is to lessen the harshness of any adjustments forced upon particular sections of the industry by general economic development. Any public funds spent for this reason must clearly be seen to reach farmers who need it on these grounds, as distinct from prosperous farmers who have no claim to compassionate payments.

The "Small Farm Scheme" is designed to give financial help to those small farmers who are prepared to carry out, over a period of three to five years, approved plans for the improvement of their farming business. To qualify for assistance farms must be (a) between 20 and 100 acres in size, (b) have a labour requirement of between 250 and 450 man-days and (c) have a farm business plan capable of increasing the profitability of the holding.³

The farmer who qualifies on these grounds will be assisted to carry out his plan by a general grant of £6 per acre up to a maximum of £360 (payable over three years), and by other grants for specific purposes of good husbandry. In total the limit of assistance is set at £1,000 per farm. The net additional expenditure involved (estimated at £6 million for the first year) is to be financed out of the total guarantees given to the industry and is not to be an additional burden on the Treasury.

Up to the present the scheme has not had the success hoped for.⁴ This is largely because the conditions of eligibility have been set too low. In particular, the standard man-days qualification has had the effect of making it virtually impossible for the majority of holdings between 50 and 100 acres to qualify. Many small farmers within the stipulated acreage range have by their own efforts raised the size of their business above the maxi-

³ The introduction of man-days requirements (calculated on a standard basis of crop acres and livestock numbers) as one measure of size of business, and the need to produce a budget, show how the concepts of the agricultural economist are beginning to be used in the implementation of policy.

⁴ By July 1959 applications had been received from 19,000 farmers (less than half the 40,000 estimated to be eligible), 11,000 farm business plans had been submitted, and 7,000 plans had been approved.

mum labour qualification and have thereby found themselves outside the scheme.

This situation may have two unfortunate consequences. First, it looks as though only the lowest strata of small farmers, many of whom may well prove to be incapable of improving their management, will qualify for assistance. If it turns out that the main body of small farmers have not in fact been helped, the Government may well be deprived of the immediate opportunity to follow a more realistic line for the prices of those products such as milk, pigs and eggs, which together make up the bulk of the income of small farmers. In other words, by making these special provisions for small farmers, it should have become possible to adopt a more stringent policy towards the other sectors of the industry without incurring the risk of inflicting great hardships on large numbers of relatively high-cost but deserving small producers.

V

There have been three other developments in recent years which point to a policy of increasing efficiency by economic pressure rather than by direct control, and to a policy of directing subsidies towards measures for improving farm equipment and farm methods.

The first is the repeal of the disciplinary provisions of the 1947 Act which gave powers to put the hopelessly inefficient farmers and landlords under official supervision, and, ultimately, to dispossess them. It is not without interest to note that the farmers' leaders were not in favor of the repeal of these harsh sanctions. This was because their inclusion in the Act had been widely proclaimed as part of the quid pro quo of efficiency to be given by the industry in return for the guarantee of stability. The farmers were all the more ready to retain this semblance of their share of the bargain since the sanctions concerned had become almost inoperable anyway.

The second measure was the easing of the procedure whereby landlords can raise rents. The guidance to arbitrators introduced in 1947 had tended to hold down rents below their normal competitive levels, though this was probably not the intention. The change made in 1957 is designed to correct this situation by requiring the arbitrator to fix rents in accordance with the figure at which a farm might reasonably be expected to be let by a willing landlord in the open market to a willing tenant. The fact that this step was taken is in itself an indication of the increasing anxieties which were felt about the repercussions of low rents on the general pattern of farming and especially on the volume of investment in "landlords' capital."

Thirdly, the policy of directing subsidies towards improving techniques and improving equipment was extended in 1957 by the Farm Improvement Scheme. Grants had previously been available for such things as

drainage and water-supplies, covered silos, farmhouses and cottages, and for the improvement and reclamation of marginal land. On technical grounds these direct grants have proved their worth as a means of improving the competitive efficiency of the farms concerned. It is little wonder that they are increasingly in favor as a sensible method of implementing the general support policy.

The new scheme introduced in 1957 represents a more ambitious attempt to help the extensive re-equipment of the farms of the country. The Government is prepared to spend up to £50 million in the next ten years for this purpose. Provision is made for the payment of grants of one-third of the cost of most long-term capital improvements not already state-aided. Farms eligible for grants must be equipped economic units, the proposed improvements must be capable of giving a reasonable return on cost and be of the kind which a prudent landlord would be willing to make. In addition, grants are made available to meet one-third of the legal and other costs incidental to the amalgamation or absorption of uneconomic into economic farm units.

There has been quite a flood of applications for these various grants.⁵ But, sad to relate, so far the incentive to the amalgamation of farm units has proved a non-starter.

VI

The five year agricultural expansion programme of a 20 per cent increase in net output announced in 1947 was broadly completed by 1952. In 1952 the Government suggested a further rise of output to about 60 per cent of the pre-war level for the next five years. It reached 61 per cent over pre-war by 1957, and the official view since then has been that no further expansion in gross output is called for.

Not only has a halt been called to further total expansion, there has also been a change in the emphasis of commodity policy.

The production of milk, pigs and poultry has risen to embarrassingly high levels. Not only has supply tended to outrun demand at existing prices, but the increase in the inputs of concentrated feedingstuffs, the marginal supplies of which are imported, has been regarded as adversely affecting the balance of payments. The policy, therefore, has been to reduce the prices of these products, though the possible effect of such reductions on the small farmer has undoubtedly tended to be a retarding influence on the downward pressure.⁶

⁵ By the end of June 1959, over 70,000 applications had been received, and 40,000 had been approved to cover improvements costing about £28 million and involving some £9 million in grants.

⁶ In the case of milk, reduction in the standard price is less essential. Since the guarantee is limited to a maximum quantity, increases in output automatically lower the price received by farmers.

Simultaneously, in order to encourage more self-sufficiency in feeding-stuffs, the prices of feed grains have been moved up a little in relation to the price of wheat. The price of mutton and, more especially, the price of beef have been increased to encourage some dairy farmers to turn over to these products in view of the downward trend in imported supplies. These production adjustments are, in fact, occurring.

In the 1959 Price Review White Paper the particular aims of commodity plans are stated as follows:

- (a) maintenance of the arable acreage at roughly its present size, but with less emphasis on wheat than on feed crops,
 - (b) greater reliance on home-grown feed for livestock,
 - (c) production of more beef of the quality wanted by the market,
 - (d) continued reduction of the costs of producing pigmeat and further efforts to satisfy market requirements,
 - (e) production of fewer eggs and less milk than is at present in prospect.
- These particular aims are intended to further the general policy objective of "a steady improvement in the competitive position of the industry, and in its adaptation to the needs of the market."

VII

It may be useful to end this short account of recent changes in Britain's farm policy by making one general observation on the peculiar difficulty which faces those responsible for its formulation.

The difficulty in mind is that of forecasting production and market trends in a country so dependent upon imports for its food as Britain is. This difficulty of forecasting applies not only to the formulation of a long-term policy, but also to the smooth working, in the medium-term, of the whole procedure of price support. From the wider point of view, it involves, of course, the fundamental question of how, in the long run, will Britain's terms of trade move. Despite years of discussion and disputation economists are without an answer to this question. At first sight, it might seem that without some answer it is impossible for Britain to formulate a rational long-term policy for its agriculture.

But in reality what matters more to the question, "Which and how much farm products to produce currently at home, and how to equip farming and serve it in other ways?" is, not so much what is the ultimate trend of world trade, but rather *how rapidly* is any particular new development in that field likely to make itself felt, and *how swiftly* could farming adjust itself effectively to suit.

If we now let our farm output run down to the fullest extent indicated by free commercial dealings, so as to benefit to the full in the short run from terms of trade favourable to a country not producing all its food and

raw materials, and if, later, these terms of trade move in a less favourable direction, then two important questions arise. First, how rapid is this movement likely to be? Secondly, how effectively and quickly could our farming (in the posture it would then be placed) build up intensity levels and production generally?

Clearly these are questions which involve social costs such as disturbances and upheavals to human beings as well as purely financial ones. The changes of recent years are an encouraging sign that considerations such as these are increasingly in the mind of those responsible for shaping policy.

Public funds which are spent to maintain agriculture at a level higher than that to which it would otherwise gravitate are being increasingly directed towards measures likely to improve the ability of farmers to build up production quickly should this become necessary. Capital investment, in particular, is being encouraged towards those things which will keep fixed equipment modern and in good repair and keep the land in good heart. Last, but by no means least, there is the increasing expenditure on education and research, and on the promotion and diffusion of technical and managerial expertise.

This kind of public expenditure must be a good investment to the taxpayer for, in the long run, it could become the surest way of progressively reducing the present heavy cost of supporting the industry through price guarantee.

CANADA'S EXPERIENCE IN AGRICULTURAL SUPPORT MEASURES

A. H. TURNER

Canada Department of Agriculture

CANADA, like most other countries throughout the world, has become more and more involved in what may be looked upon as permanent government assistance and security measures for agriculture as well as for other parts of the economy. In general, it may be said that Canada in its government assistance policy over the years has attempted to emphasize production and marketing efficiency so that quality, quantity and cost would provide not only an adequate supply of food for the domestic market at reasonable prices but also a substantial flow of agricultural products to external markets.

The Canadian economy is dependent to a considerable extent on the income from the production and distribution of agricultural products, a substantial portion of which comes from the sale of these agricultural products entering export trade. As Canada grows industrially and enlarges her own consuming population (Canada's population has more than doubled since 1921), the proportion of agricultural products exported will likely decrease in line with the trend over the past few years, though the volume and dollar value may remain constant or increase as a result of the greater capacity to produce both at the farm and processing levels. Due to the significant part that agriculture and related industry play in the economy as a whole as well as in export trade, government assistance and aids to agriculture in Canada has usually been aimed at the greatest measure of resource development by attempting to bring about greater efficiency somewhere in the production or marketing process, either immediately or over the long run.

Canadian taxpayers, at both federal and provincial levels, in addition to the payment for research, extension and administration of legislation, have provided a wide variety of assistance to agriculture over the years including: encouragement of immigration; financial aid to reclamation, rehabilitation, conservation, irrigation and land settlement programs; improvement programs for livestock and crops, including the distribution of good breeding stock and better varieties of seed; premiums for quality production; assistance in eradication of disease; maintenance of grade standards; encouragement to agricultural and co-operative self-help agencies in their attempt to improve production and marketing efficiency; grants for agricultural fairs and exhibitions; financial aids to facilitate orderly marketing including subsidies to public cold storage; the actual

ownership of terminal elevator facilities and cold storages; as well as several forms of transportation assistance.

In making these payments to the agricultural industry, however, it would not appear that Canadian taxpayers have had proportionately as heavy a tax load placed on their shoulders for this purpose as in the United States and the United Kingdom. While the statistics may not be strictly comparable, the indication in recent reports is that government subsidy and assistance payments to agriculture in the United Kingdom have formed about two-thirds of the net farm income and in the United States, according to the President's recent message to Congress, federal payments are equivalent to 40 per cent of the net farm income in that country. On the other hand, although statistics are not readily available, it is likely that the Canadian taxpayers' proportion as set out below is higher than in agriculturally based economies like those of New Zealand and Denmark.

In the last ten years in Canada, while there is no combined figure readily available for all provincial and federal aid, it is likely that the average aggregate payment has not been more than \$100 million per year, including assistance to wheat and grain producers, while the net farm income of Canadian farm operators during these years has never been less than \$1 billion and has approached the \$2 billion mark on two occasions. Even if Department of Agriculture administrative expenses in both Federal and Provincial Governments were added to the assistance programs, it would appear unlikely that the Canadian taxpayer has contributed more in direct assistance to agricultural operations and administration relating to agricultural programs than about 10 per cent of the total net farm income on the average in the post World War II years.

The Canadian Government has, through broad fiscal, monetary, and credit policies, aimed at retaining and aiding the development of individual initiative, enterprise, and maintenance of full employment in a gradually progressing economy. This has included broadly based security or welfare measures such as family allowances and a wide variety of government pensions to provide for a broad distribution of incomes to individuals, whether they are capable of productive work or not. Such fiscal policies, which represent a cost to at least a portion of the taxpayers, have no doubt greatly aided in the general demand for the agricultural and food products in the domestic market. Possibly something should be added to the contribution of the taxpayer to agriculture mentioned above for this aid, but no satisfactory mathematical measurement can be made. In segregating agriculture in this broad general way it should be noted that other groups in the economy have also received direct or indirect assistance. The most notable example is tariff protection for industry groups,

including agriculture, which a recent committee report prepared for a Canadian Royal Commission estimates indirectly costs the Canadian consumer on an annual basis close to \$1 billion. Canada also has a full system of contributory unemployment insurance, not including agricultural workers, and health insurance, which is partly paid for by the Federal Government. In addition there is assistance for mines, for various transportation and marine services, for cultural activities such as national broadcasting and a large number of grants for various groups throughout the country.

With respect to agriculture in Canada, there is considerable legislation that allows producers to join together to undertake through self-help schemes the operation and financing of more orderly marketing to help them secure the maximum returns from the sale of their products. In addition, the Federal Government has been authorized under the Canadian Wheat Board Act to take control of the marketing of wheat and coarse grains produced in the Prairie Provinces of Canada. For all other agricultural products provision has been made to intervene in the pricing system through the provisions of the Agricultural Stabilization Act passed in 1958, which Act succeeded the Agricultural Prices Support Act passed in 1944. These Acts have been designed to at least modify the extent of price fluctuations, which may be sharp from time to time in the so-called free market.

Canadian farmers have been willing, or at least have accepted, that some levelling at the peak of the price curve or cream off the top of the bottle should flow to consumers and taxpayers, provided exaggerated decreases in prices or returns are avoided at the bottom of the price curve. In practice, the Wheat Board, for example, has avoided a selling price to Canadian millers above that which has been received in international markets even at times when bulk contract prices were probably somewhat below what might be justified for sales in the domestic market. On the other hand, in addition to the stabilizing effect of the pricing policy of the Wheat Board, wheat farmers have had financial aid through the Prairie Farm Assistance Act, the Prairie Farm Rehabilitation Act, and other assistance payments mentioned later in this paper. Recently the Federal Government passed a Crop Insurance Act to provide for payments towards provincial schemes of crop insurance.

Similarly, the Agricultural Stabilization Board and its predecessor the Agricultural Prices Support Board have sold quantities of their accumulated stocks in the domestic market at appropriate times rather than let prices rise quite as high as they might have done due to short supply periods. This type of program, when operative, has tended to modify or smooth the top of the price curve for the products concerned.

Direct Cost of Federal Supports to Agriculture in Canada

In reviewing the types of assistance made available to Canadian agriculture since 1900, in addition to that related to departmental expenses concerned with research, extension, and general legislative administration, it is interesting to note not only the increasing amounts of such assistance but also the changing emphasis. In 1900 the added assistance amounted to \$66,000, made up of \$53,000 of what might be termed aids to marketing and \$13,000 of what might be termed aids to production. In 1910 the total was \$184,000, made up of approximately 50 per cent aids to marketing and 50 per cent aids to production, including \$72,000 for compensation with respect to the slaughter of diseased animals. In 1920 the total was \$2,156,000, of which \$76,000 was for aids to marketing. In 1930 the total was \$2,227,000, with \$323,000 for aids to marketing. In 1940, when net farm income was about \$500,000,000, the total was \$15,438,000, of which roughly one-third was for aids to marketing and about \$6,700,000 for assistance to those having little or no crop on Prairie grain farms. In 1950, with a net farm income of \$1,250,000,000 the total had increased to \$115,022,000, which included \$65,000,000 paid to the Prairie wheat marketing pool for distribution to those delivering wheat during the bilateral Canada-United Kingdom agreement of the late forties, \$15,500,000 for freight assistance on feed grain moved from the Prairies to other parts of Canada, and \$14,000,000 for other aids to marketing as well as \$3,150,000 for assistance to Prairie farmers due to low crop yields. In 1957, the last year for which complete figures are available on a comparable basis, the total was approximately \$92,000,000, with \$35,500,000 paid into the wheat marketing pool in respect to the Temporary Wheat Reserves Act, \$17,800,000 for feed grain freight assistance, and \$13,600,000 for other aids to marketing as well as \$11,600,000 for assistance to Prairie grain farmers having low crop yields and \$11,400,000 for irrigation, land settlement and rehabilitation developments. The cost of the added aids to agriculture since 1900 has increased greatly even in terms of constant dollars, and while dollar grants for agricultural associations and other production aids (with the exception of irrigation, rehabilitation and land settlement expenses) have remained fairly constant since 1920, there have been substantial increases in payments relating to marketing, price and income payments.

The remainder of this paper will deal, for the most part, more specifically with the development of support measures relating to agricultural prices and income.

Price Support Legislation

As mentioned earlier the Agricultural Stabilization Act was passed in 1958 as the successor to the Agricultural Prices Support Act. Since the

new Act provided for the taking over of all the property, rights, obligations and liabilities of the Agricultural Prices Support Board by the new Agricultural Stabilization Board, I shall deal with the whole subject of price support with the exception of that related to Prairie wheat and grains, which have special federal marketing legislation, in this section of the paper in order to save duplication in description.

As indicated in the previous section, payments related to aids to marketing were common prior to 1940. These included guaranteed advances, bonuses, premiums for quality, assistance in building cold storage and other facilities for warehousing products, as well as numerous types of transportation and price assistance, mostly on an ad hoc basis.

In 1944, partly if not wholly as a result of the acceptance by farmers of price ceilings during wartime, the Parliament of Canada provided a formal basis for agricultural price support for all products except wheat for the transition period from war to peace. As has been noted, wheat has been provided for under special marketing legislation. This Act was known as the Agricultural Prices Support Act. In 1958 the Agricultural Prices Support Act was succeeded by the Agricultural Stabilization Act.

These acts both provided for a three-man administrative Board now known as the Agricultural Stabilization Board. At present all members of the Board are permanent civil servants.

Under the Agricultural Prices Support Act, provision was made on a permissive basis for a General Advisory Committee. This Committee at that time was chaired by the President of the Canadian Federation of Agriculture a large farm organization, and included the Deputy Ministers of Agriculture, or their representatives, from all provinces, as well as producer representatives from the main agricultural regions and the commodity groups. Under the new Agricultural Stabilization Act the Minister is required to name an Advisory Committee of up to ten members who shall be farmers or representatives of farm organizations. In addition, the Board under each Act has, as seemed appropriate from time to time, called in special advisory committees either from trade or from producer groups to assist in the Board's operations in a particular field.

The Agricultural Stabilization Board has at its disposal a revolving fund of \$250 million, which is \$50 million higher than that made available to its predecessor. This fund is maintained at that amount by annual appropriations by Parliament to cover any loss that may take place during the year, and if there should be any surplus to the Board's account, it is to be turned over each year to the general Consolidated Revenue Fund.

During the period in which the Agricultural Prices Support Act was operative, the Board used a total working capital of approximately \$600 million in supporting 11 different commodities at various times during the

12-year period 1946 to 1958. Of this amount it recovered, through resale of commodities purchased, approximately \$500 million, leaving a total net cost to the Canadian taxpayer of \$100 million for its operations over the 12-year period. The highest single-year use of working capital in this period was \$165 million. At April 1, 1958, the inventory of products on hand was valued at \$26 million, and an additional \$102 million of working capital was used during the first year of operation under the Agricultural Stabilization Board ending March 31, 1959. Losses incurred during this latter year amounted to \$15 million.

No formula for establishing price support levels was set out nor was the Board required to support any particular agricultural commodity under the Agricultural Prices Support Act. Under the Agricultural Stabilization Act all price support levels have to be related to a price formula based on the most recent ten-year average of market prices for the product concerned. In addition, the Board, unless the Government sets a higher support level, must support the prices of nine named key commodities at not less than 80 per cent of the ten-year average market price. The named commodities are butter, cheese, eggs, cattle, hogs, sheep, wheat, oats and barley (in the case of the latter three, the support applies to grains produced outside the Prairie areas designated under the Canadian Wheat Board Act). Other commodities can be supported at such percentage of the ten-year average market price as may be approved by the Government from time to time. The other commodities are in the same position as all commodities under the Agricultural Prices Support Act, except that under the new Act the support level has to be prescribed as a percentage of the ten-year average market price.

The Agricultural Stabilization Act also requires that the prices established for the nine named key commodities have to be announced so that they can apply for 12 months from an effective date following the date of the announcement. The general intent of the Act is that a similar procedure should apply to all commodities, but legally there is leeway for shorter or longer periods of application for support prices to be announced in the case of other commodities than those which the Board is required to support at all times.

In the first year of operation of the Agricultural Stabilization Board, 21 commodities were under support with a price prescribed in terms of a percentage of a ten-year average market price. Of the mandatory commodities, butter was supported at 107 per cent of the ten-year average market price, cheese at 110 per cent, eggs at 85 per cent, hogs at 84 per cent, wool from sheep at 110 per cent, and cattle, lamb, wheat, oats and barley at the mandatory level of 80 per cent of the ten-year average market price. The 11 other commodities were supported on the following

basis: dry skimmed milk, 107 per cent; soya beans, 90 per cent; sugar beets, 93 per cent; British Columbia tomatoes for processing, 112 per cent; asparagus for processing, 86 per cent; British Columbia raspberries for processing, 102 per cent for SO_2 and 91 per cent for frozen; apricots, 80 per cent; British Columbia apples, 93 per cent; honey, 91 per cent; peaches for processing, 89 per cent; and Prince Edward Island potatoes, 36 per cent. In the case of the Prince Edward Island potatoes, the support was introduced to give farmers a payment on their No. 1 potatoes left in their storage bins at the end of the marketing season.

In the current fiscal year, 17 commodities are now or will shortly be under support, with percentages of the ten-year average market price ranging from 52 to 110. Seven have percentages of 80 or lower, and four have percentages over 100.

The Agricultural Stabilization Board may support the price of products in any one or more of three ways, namely:

1. An offer to purchase by the Board.
2. Underwriting the market through producer guarantees, commonly called the "deficiency payment" method.
3. Making such payment for the benefit of producers as may be authorized for the purpose of stabilizing the price of an agricultural commodity. The third method is new under the Agricultural Stabilization Act.

Of the 21 commodities under support in the first year, 12 were under programs using the offer-to-purchase technique, seven were under programs underwriting the market through producer guarantees, and two were under programs based on the principle of payments related to producer guarantees for certain grades of product.

Other points of administrative significance are covered in the legislation, but I think the above sets out the main items of general interest. It should be noted that, in carrying out programs of support, quality is given a high priority, and usually only top grades of a product are supported.

Before turning to some examples of support activity, I wish to say a word about disposal. The Board has no statutory limits placed on it in the Act insofar as disposal of product is concerned. Unless the Government makes a regulation or the Minister of Agriculture gives a direction, the Board legally may give the acquired product away, sell it, or otherwise dispose of it. In practice the Board has attempted to sell on a commercial basis and at all times has been quite conscious of minimizing the loss to the taxpayer. Despite its legal authority, the Board also refers to the Minister any proposal that involves substantial loss, and he in turn may refer the proposed action to the Government. This is done not only on account of the loss involved but in order to minimize the possible interference with policies of other departments of Government. If the Board

can sell at cost or better, it usually proceeds to do so without reference to other authority. Generally speaking, the Board has not attempted to sell at more than cost, including its carrying charges, even though on two or three occasions it has made a profit when sales were made more quickly than estimated and carrying costs were lower than anticipated or when a price support was raised to a higher level while the Board still had an inventory. Whether or not it sells at cost, the Board always tries to sell to the best possible advantage up to cost. Very few commodities acquired under price support in Canada have been donated or given away by the Board, and those which have been were paid for by the appropriate department of Government at commercial prices. Export sales of Board products may or may not be made at a loss, but in all cases an attempt has been made to get the best price for the quantity and quality of product available at the time of sale. In general, Canada has attempted to interfere as little as possible with normal commercial marketings of other exporting nations by maintaining prices at or near current world market levels and by not selling competitive products at concessional prices in major markets of friendly exporting countries.

Canadian trading firms as well as export and import firms in Canada and abroad cannot be given too high praise for their efforts to co-operate with the Board and to be realists about markups in handling and disposing of the small proportion out of the total product available which has been acquired by the Agricultural Stabilization Board and its predecessor the Agricultural Prices Support Board. The trade is aware that the Board intends to sell a product as quickly as possible after acquiring it and in the best market possible, so usually suggestions come forward voluntarily, but as mentioned above trade advisory groups are called in from time to time so that the Board may benefit from their collective as well as their individual views in arriving at a decision.

Selling programs in the domestic market in particular have also been worked out with the trade from time to time so that stocks of semi-perishable products may be turned over or exchanged and thus avoid any undue deterioration in quality.

A few examples of Board operations are now listed. Although not complete, they are outlined to give an idea of some of the actions taken in the performance of support operations. Some discussion is also included on western spring wheat, which is handled under the Canadian Wheat Board.

Creamery butter

There has been a price support on Canada First Grade creamery butter continuously since 1948, at which time the Government decided to sup-

port this almost entirely domestic product as the basic national support for the dairy industry.

Since 1948 the price support has been set and announced in advance of the production year. In 1950 the Board had a carryover of some 20 million pounds, and there was an apparent drop in domestic disappearance of butter. In these circumstances, the Government authorized the Board to reduce the price support from 58 to 53 cents per pound. Within the next year a butter shortage developed, and the Government in cooperation with the trade, in order to protect the consumer from high prices and to protect long-run producer interests, imported 22 million pounds of butter from Europe and New Zealand at delivered prices ranging from 61 to 63 cents per pound. Import controls were placed on butter at this time in order to ensure satisfactory distribution among the Canadian trade, and they have been continued since that time for more general protective purposes. As a result of this shortage, the price support was revised upward to 58 cents per pound and extended for a period of two years. The support price remained at 58 cents from 1951 to April 30, 1958, usually announced on a two-year forward basis.

Aggregate butter disappearance in Canada continued to increase from 1951 to October 1957 when after a relatively lower production year the market price reached 63 cents per pound. Market prices continued strong throughout the winter of 1957-58, although disappearance did not continue to show the percentage increase of several years previous. At May 1, 1958, the price support was raised from 58 to 64 cents per pound and has continued at that level since that date. Although there have been some exceptionally heavy production years within this period, the Board has sold only about 10 million pounds of butter at concessional prices in the export market.

The total cost of butter support programs through March 31, 1959, was slightly more than \$16 million on an average production of about 300 million pounds per year during the support period. This approximates a cost of less than one-half cent per pound over the 11 years that supports have been in operation, in terms of total distribution of creamery butter. Although butter has been under import control, the Government has shown its readiness to allow the importation of butter during short supply periods in order to stabilize the price to the consumers.

Dry skimmed milk

The Board has not supported dry skimmed milk on a regular basis but did support this product from time to time prior to 1957 and has been supporting it continuously since 1957. In 1957 and 1958 the support price proved to be an incentive price, and in 1958 the Board acquired through

purchase, in spite of increased Canadian consumption, more than half of the total production, or about 105 million pounds. The disposal of quantities such as this has involved the Board in sales to the Department of External Affairs for donation to international relief agencies, sales for feed to approved European markets at concessional prices and sales to Central and South American markets, which were traditional Canadian markets, at price levels which were competitive with United States concessional prices on the same product up to March 1, 1959, at which time the United States again lowered their export price and Canada did not follow suit.

At May 1, 1959, the Board was authorized to change its policy by decreasing the support price from 15 to 10 cents per pound for spray process for a period of five months through September 30, 1959, after which the price support would be withdrawn on this product. Also starting May 1, 1959, the Board was authorized to pay a flat 25 cents per hundredweight subsidy on all milk used for manufacturing except on milk from producers who delivered any portion of their whole milk for use in the fluid bottled market trade.

Shell eggs

The Government had a continuous support price of 38 cents per dozen for Grade A Large eggs delivered into storage to Board specifications from 1950, when Canadian contracts with the United Kingdom for eggs ceased, until May 5, 1958. At this time the support was raised to 44 cents per dozen for Grade A Large, basis Montreal, with appropriate market differential reductions at other storage points in Canada.

Up until 1957 the Board operated the egg program on a deferred offer to purchase whereby on application the trade was issued lot numbers for eggs stored to price support specifications. The Board did not actually take or seek ownership until an appropriate period late in the marketing year, unless it seemed necessary to do so in order to encourage sales. The only year in which any substantial cost was involved under this program up until 1957 was in 1954 when the Board lost over \$600,000. Since 1957 the Board has offered to purchase eggs outright at the price support level due to more or less continuous surplus conditions for a substantial part of the year.

The cost of egg support programs from 1950 through March 31, 1959, has been close to \$6 million with most of this cost being associated with operations since 1957. To date in the current year the Board has purchased more than 900,000 cases of eggs, most of which have been sold at concessional prices in shell form to Canadian government approved South American markets or in processed form to approved European markets.

Due to the apparent continuous production increase and cost to the

Government, it would appear that the egg support level has become an incentive level. The Minister, therefore, has announced that as soon as a practical plan can be worked out, the egg program will be changed to one of producer guarantee with payments when necessary to make up the difference between market price and the guarantee or support level. Payments will be restricted to a limited volume of marketings which will be specified. It is expected that this new type of support program for eggs will come into effect within the next few months.

Hogs

Support prices on hogs have been in effect each year since the termination of the United Kingdom contracts in 1950. However, with the exception of 1952, when the United States embargo on livestock from Canada was in effect due to the foot and mouth disease, market price levels were above the support level until October 1958. During the program in 1952 the Board purchased approximately 200 million pounds of pork in the form of cuts, Wiltshire sides and canned pork. During the buying program in 1952 the Board started an active selling campaign for canned pork in the domestic market by reducing the price 40 per cent below cost. Due notice was given so that private retail and wholesale inventories might be sold in the best manner possible before the public announcement of the Board sale was made. A unique co-operative effort on the part of everyone in Canada allowed the Board to sell at the rate of about three times the annual consumption for a period of about 18 months.

Since October, 1958, the Board has purchased frozen pork cuts and canned pork. Some trial shipments have been made to export markets and some sales at cost have been made in Canada and the United States, but no large scale selling program has been undertaken to date.

The Minister has announced that the Board has been directed to change the purchase program to one of producer guarantee with deficiency payments being made to producers on a limited volume of marketings. Until this program is worked out it is likely that the Board will continue to operate its sale policy on its present basis.

Wheat

As is well known to this audience, wheat is the most important commercial agricultural product in Canada. It has represented as high as one-third of the total product of agriculture and probably today represents at least one-fifth. Wheat farming is not only an important segment of agriculture in Canada but about two-thirds of the production is sold in the export market, which makes wheat one of Canada's leading export commodities. For these and other reasons, wheat has usually been dealt with

by special legislation, with the exception that other grains channeled through similar facilities are usually included in legislation relating to wheat.

Up until the First World War wheat had been left to find its own price level through the open market. However, under the exigencies and emergency conditions developing towards the end of the First World War, the Canadian Government took control of wheat marketing in 1917 and 1918 and paid a fixed price for wheat. In 1919, after a brief return to competitive trading, a Board was established with authority to take over the marketing of wheat; and this Board instituted a compulsory pool with a guaranteed initial payment and, as it turned out, a substantial final payment as well. However, in 1920, despite protests from the farmers, the Government withdrew, and the farmers with the aid of the philosophy and organizing ability of a Californian, Aaron Sapiro, established their own wheat pools. These pools were intended not only to carry out a co-operative and pooling operation but to exercise a substantial influence on the maintenance of the export price at as high a level as possible.

In 1929-30, following the drastic fall in world prices, the Government had to give financial backing to the pools because sales returns were inadequate to cover initial payments. The period from 1930 to 1935 was one of attempts to carry out various stabilization measures to relieve the wheat surplus and low price situation which existed. Finally in 1935, after several years of urging by the farmers' representatives, the Government of the day established the Canadian Wheat Board. In 1936-37 and 1937-38 a new Government provided that the Canadian Wheat Board would only operate when the price of wheat declined in the open market below a price of 90 cents per bushel, and it set the Board's initial advance of 87½ cents per bushel.

The emergence of the Second World War, as well as the substantial wheat acreages and world surpluses of wheat in the 1939-42 period, kept the Government in business. In 1943 the Government felt it was necessary to protect wheat supplies for its Allies, particularly the United Kingdom, and it finally decided to introduce a compulsory 100 per cent wheat pool in Western Canada to be operated by the Canadian Wheat Board, with no further future trading to be allowed on the Winnipeg Grain Exchange. In 1959 this compulsory pool is still operating. In 1949 Manitoba tested by referendum whether or not farmers of that province favoured marketing oats and barley on a 100 per cent pool basis through the Canadian Wheat Board and received a substantial "yes" vote. Apart from the producer wishes, the Canadian Wheat Board has proved a convenient business vehicle for the Government to help handle price control during wartime, the wartime and postwar bulk export contracts, and more recently the Government's obligations under international trade agreements.

During the period since the war the Canadian Government has not established a policy of production or acreage control but has used a marketing quota system under which an attempt has been made to allocate available elevator space on an equitable basis per farm by use of delivery quotas in terms of bushels per acre. Under this program acreage seeded to wheat in Western Canada has been reduced voluntarily from a peak of over 27 million acres to a little less than 21 million acres in 1958. There has been about a 10 per cent increase in acreage in 1959 over 1958 likely due in part to expected lower total supplies stored on farms.

In 1955 the Government introduced the Prairie Grain Producers' Interim Financing Act which provided certain guarantees with respect to bank loans to farmers on a limited quantity of farm stored grain. This Act was allowed to lapse after the new government in 1957 passed the Prairie Grain Advance Payments Act which provided for interest free refundable cash advances on farm stored grain under certain conditions and limits. The total advances under this 1957 legislation have amounted to about \$35 million annually.

In 1956 the Government introduced the Temporary Wheat Reserves Act which provided for payments of storage charges into the Wheat Board pool on all wheat above an average of 178 million bushels in store in elevators at July 31, the end of the crop year. Including and since July 31, 1956, payments into the wheat pool under this Act by the Federal Government have amounted to approximately \$135 million.

For some time now Prairie grain farmers have been agitating for deficiency payments on the wheat and grain crops marketed in Western Canada since the crop year of 1955. In 1958 the Government provided, for one year only, an acreage payment to farmers in Western Canada based on \$1 per cultivated acre up to 200 acres. The cost to the Government for this payment has been approximately \$41 million compared to about \$300 million requested as deficiency payments.

Summary and Conclusions

The Canadian approach to the implementation of agricultural support measures to date might be termed a moderate one. The Canadian Parliament has recognized that national resources should be used for assistance to agriculture to the degree consistent with further development of that industry as an integral and important part of the national economy.

The new Government elected in 1957 has introduced the use of a formula as a basis for establishing and comparing price support levels. It has also introduced a requirement for mandatory price supports for a selected group of products. Unlike formulas used in some countries, the Canadian formula is the product of the market place in that it is a moving average

of market prices. From an economic point of view it may be criticized for the length of period covered, but this is more a question of degree than a question of principle. With respect to the mandatory price supports, it is too early to tell just what the results may be, but there are some indications that the minimum percentage required to be maintained in the case of hogs and eggs may, unless payments are limited, mean heavy expenditures for the taxpayers and numerous headaches for the administrators, while at the same time producers' returns may tend to remain at the support level the year round.

Recently the Directors of the Canadian Federation of Agriculture announced at their semi-annual meeting that they favoured the withdrawal of the mandatory requirements with respect to hogs and eggs. The Government has not indicated any intention to withdraw the system of mandatory support for hogs and eggs, but it has directed the Agricultural Stabilization Board to develop a program whereby payments will be provided to farmers only on a limited basis when the market price falls below the support level. At the present time the intention is that payments will be limited to a certain quantity of product of the designated grade or grades marketed during a period of time insofar as individual farmers are concerned. The other large Canadian farm organization, the Interprovincial Farm Union Council, unlike the Canadian Federation of Agriculture, has favoured the proposed system of so-called deficiency payments for hogs and eggs as well as for other products. The Farmers' Union has, however, recommended that limits should be put on the total money payment to any individual farmer rather than on a commodity-by-commodity basis. Many other regional and trade groups as well as individuals, mainly associated with the farming industry, are also currently exercising their democratic right to criticize, make suggestions and give advice. In the case of hogs, the United States Farm Bureau Federation has also taken note of the proposals in Canada and has been urging the United States Congress and Administration to be ready to take appropriate action if the so-called deficiency payment plan for hogs results in subsidized exports to the United States.

The various representations will become grist in the review mill and may result in some modification of detail or delay in the development of some part of the present intentions for operation, but at present it seems unlikely, until the new policy has been tested, that the general proposal with respect to technique of operation will be changed. Theoretically it can be assumed that if levels are as much an incentive to production in the case of hogs and eggs as they appear to be, and if the Government continues to set the level at the mandatory floor without some limits, the price support will gradually come down no matter what technique of support is

used. The deficiency payment technique without limits may reduce the ten-year average market price somewhat more quickly, but in doing so it may result in higher total costs to the taxpayer in the interim, which might be offset in part by lower consumer prices.

The other question which will arise if satisfactory limits cannot be established and price reductions take place, is whether or not the attempt at maintaining levels of support over a large number of commodities, with producer returns approximating support level on a portion or all of the product and a lower market price on the remainder, is likely to bring more total income to the farmer than the insurance type of support level under which the widest fluctuations in price are eliminated but room is left for seasonal and some cyclical fluctuations of a more gradual type.

Regardless of future developments, the course Canada is likely to continue to try to develop is one of broad national policies to maintain an expanding demand for agricultural products in both domestic and export markets and to encourage the greatest degree of self-help by those in the industry concerned so that production and marketing efficiency may be at a maximum level, with support measures occupying a significant but not necessarily the major role in assistance to agriculture.

Appendix

Net cost of Assistance under Agriculture Prices Support Act and the Agricultural Stabilization Act from 1946 through March 31, 1959, classified by Commodity:

Potatoes	\$ 2,888,623
Apples	7,658,317
Dried white beans	194,420
Extracted honey	177,066
Dry Skimmed Milk	8,728,711
Cheddar cheese	879,175
Creamery butter	16,308,647
Shell eggs	5,637,071
Hogs	36,809,305
Cattle	33,358,016
Fowl	577,448
Lamb	281,176
Wool	1,541,294
Tomatoes	51,641
Raspberries	429
Asparagus	106,021
Total	\$115,197,360

Government payments *re* western grains in same period but not including payments under Prairie Farm Assistance Act:

Payments into wheat pool	\$200,682,000
Deficit in oats pool	2,113,000
Acreage payment (estimated cost)	41,000,000
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Total	\$243,795,000

Interest-free Refundable Cash Advances made under Prairie Grain Advance Payments Act have totalled approximately \$70,000,000 in the two years in which this Act has been in operation.

DISCUSSION: AGRICULTURAL SUPPORT MEASURES

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This comment is addressed primarily to Turner's paper, although I shall also refer very briefly to the paper presented by Professor Thomas.

I believe that we agricultural economists in the United States have been too provincial in our concerns about agricultural policy; our training, thinking and analysis almost exclusively have been focused on our own problems and means of solving them, and we have been too ignorant concerning the things that have gone on in even such close neighbors as Canada and Britain. That this is the case is our loss; we should view the experiences of other countries as laboratory experiences from which we might profit.

Therefore, I am appreciative of the efforts of Turner and Thomas in giving us a brief review of Canadian and British experience in supporting agriculture through governmental action.

In the case of Canada we have a developing country with a small population in relation to its natural resources. Its agricultural industry is relatively large, depending heavily on exports in addition to domestic consumption. Thus the industry is more directly related to the world market, particularly so I presume, through its Commonwealth connections. This is in contrast to the United States whose agriculture is oriented toward domestic demands, despite the sizeable portion of our agricultural output which is exported. Specific United States producer groups periodically support (1) attempts to insulate their domestic market from competing imports and (2) devices for subsidized disposal of farm surpluses abroad on an emergency basis.

The Canadian Agricultural Stabilization Board seems at first glance to

be reminiscent of the United States Federal Farm Board, with its revolving fund. However, a closer look shows that it goes far beyond the Farm Board or even our present price support and storage programs in the discretionary power which it has been given within the general confines of its program mission. At the same time its three-man board seems to have the opportunity of operating with great flexibility, enabling it to avoid strenuous situations which inflexible commitments would create. It seems to be the case of having more powerful tools to do a somewhat more limited job than we expect of our support and storage programs.

Several differences in objectives and methods between United States and Canadian support operations become evident as we examine the operations of the Agricultural Stabilization Board: (1) It is apparent, as is implied by its name, that the Board is basically charged with price stabilization—evening out the peaks and troughs—rather than with price supports above market clearing levels, as has been the case of our own Commodity Credit Corporation operations. There is no tie to historic price-cost relationships, but rather with a moving 10-year average. Consequently, costs to the government, and also net income transfers to farmers, have been low by comparison. (2) The Canadian Parliament appears to be only slightly involved in program detail. Much more discretion is given to the administrative agency plus its advisory committee concerning support levels, methods of supporting product prices, and disposal methods. (3) The Board readily sells the products it owns when market prices exceed support levels; at the same time there seems to be an emphasis on minimum interference with both domestic and world product markets. (4) The reliance on trade advisory groups in decision-making reminds one of British and Scandinavian practice. (5) The operations of the Board affect all major farm products, including beef and pork, and presumably the prices received by nearly all Canadian farmers. (6) Deficiency payments are used on a number of products. (7) The concern with consumer prices by the Board, even to the point of allowing importation or actually engaging in import operations in order to keep prices down, is a point not always evident in United States price support operations. This concern also must have an effect in moderating the expansion of resource inputs in commodities experiencing temporarily high prices. (8) It is apparent that Canada has not been willing to provide proportionately as large a transfer of income to agriculture from the general economy as has the United States. At the same time there has been an inclination to step in more vigorously with the force of law, as in the case of the Wheat Board legislation. It is my impression concerning the wheat pool operations that Canadian wheat farmers are called upon to bear much more of the financial burden created by heavy production or adverse cir-

circumstances in domestic and foreign markets than has been true of their American counterparts.

I would have liked to have heard Turner develop more of the circumstantial background under which Canadian support programs have assumed their present form. I would also have liked an analysis of the economic effects of specific program measures. In view of the depression in Canadian agriculture in the 1930's and the present income level in Canadian agriculture, the Canadian support measures seem moderate indeed. Turning to details I am curious as to how the widely differing support levels (52 to 110 per cent) on the various products are determined by the Agricultural Stabilization Board. Of particular importance would be the support levels for products such as barley and oats which are factors for other products. Turner's discussion evidences only moderate Canadian interest in production control in agriculture, although the Wheat Board operations do result in controlled marketing of farm products.

In closing, I would like to note several points in Professor Thomas' paper which were particularly interesting. Britain has become less of a food deficit nation and its agricultural programs have been adapted accordingly. We might learn a lesson from the ability of Britain to improvise, to discard one tool when it has outlived its usefulness and try another. Our own policy-making mechanisms seem at times to be so slow and cumbersome. Once adopted, our programs seem difficult to overhaul or discard. We could stand a dose of British empiricism in farm policy. The subsidy payment mechanism operates in such a way as to preserve price variations due to short run and local changes in supply and demand, and quality differentials. At the same time the government can treat the amount of subsidy going to agriculture as a clearly identifiable item, and one for which it will be held responsible by the public.

The "small farm scheme" seems to be akin to our own farm and home development program with the addition of financial assistance which can be used by farmers to bring into being improved farm plans. Particularly significant is the fact that part of this assistance is divorced from specific practices, but is for "working capital" to be used for the improved farm plan in general. This would appear to be an imaginative device.

The *annual price review* is also an ingenious device with which to stimulate thought and discussion of farm policy each year. It brings both government and industry together for discussion. These discussions can utilize the latest data concerning supply, demand, and price conditions relative to agriculture. Out of such devices can come intensive analysis and discussion of farm policy problems and clearer definitions of the issues to which administrators must address themselves. We have no device like this.

DISCUSSION: AGRICULTURAL SUPPORT MEASURES

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The factual data and the insights that Professor Thomas and Mr. Turner have provided about their respective countries' agricultural support programmes have been interesting but not altogether satisfying. The experience gained in both these countries in supporting agricultural product prices and incomes should provide (and has) the countries concerned and others with information on which to improve their programmes. Neither country's agricultural programme could hardly be called static. Each has evidenced considerable change over the last ten or fifteen years. Fortunately or unfortunately, there are strong political overtones in the agricultural programmes in Canada and Great Britain.

In recent years, apparently, British agricultural support policy has gone through at least three phases. Phase one occurred during the war and early post-war years in which the objectives of policy were price stability, short-run rationing, and the maintenance or increase of farm incomes. The second phase has been the change-over to programmes that emphasize stability for agriculture as a whole, encouraging factor adjustments via market-place guides. The techniques of maintaining stability have apparently changed from forward or announced prices to deficiency payments. Apparently, a third objective is developing too, namely, a positive attack on the small-farm or the low-income problem in agriculture.

In Canadian agricultural price support policy, three phases are likewise apparent. In the years following the war until 1958, the objective of that policy seemed to be entirely that of price stability. Prices were stabilized at levels probably slightly below market prices. It should be noted that while the Canadian objective worked out to be one of price stabilization the stated objective of the Agricultural Prices Support Act was to increase farm incomes. The second phase began with the Agricultural Stabilization Act of 1958 when the objective became at least in part that of increasing farm incomes through agricultural price supports. And finally, in recent government pronouncements, under the afore-mentioned act, a third phase apparently is coming to the fore, namely that of focusing agricultural support policy more on the small-farm or low-income problem in agriculture. It looks as if this phase is one of subsidizing inefficiency, whereas the British programme at least is focussed on promoting efficiency on small farms. The first year's experience under the Agricultural Stabilization Act has demonstrated to the framers and the operators of the Act the impossibility of raising agricultural product prices

above market prices without running into surpluses. Thus the Agricultural Stabilization Board has initiated a programme of limiting its deficiency payments to certain types or groups of small producers.

There are some similarities, then, between the two agricultural support programmes. Both programmes have come to put more emphasis on the low-income problem in agriculture. Great Britain's programme has moved largely into the stability of incomes and prices and a hedge against the terms of trade turning in favour of Canada and other exporters. The Canadian programme has moved at least temporarily in the direction of the Brannan Plan, subsidizing the Canadian and the world consumers.

The nature of the agricultural industry in the two economies of course is different. Almost without exception Great Britain imports some part of its consumption of all agricultural products, whereas Canada is an exporter of many agricultural products. The magnitudes of the subsidies involved are quite different. The Canadian programme is admittedly small—in fact, the whole agricultural price support programme might be said to be that of minimizing the maximum losses incurred. It has been a token programme; perhaps that has been its greatest advantage. The British programme, on the other hand, has cost that nation in explicit terms at least £250 million a year and some experts place its implicit as well as explicit costs at close to £500 million annually.

Is the subsidy of Great Britain's agricultural support plan actually aiding the farmer? Or to put the question another way, is the farmer better off, and to what extent is the British consumer better off, or worse off, because of the program? The program is said to cost Britain £500 million in subsidies. The *net* income of farmers is said to be only £325 million; further, agriculture's share of the gross national product is about £800 million, and that latter figure includes forest and fishery products. Agriculture's share of the GNP is about four per cent.

The large subsidy bill of British agriculture would seem on its face to be a high price to pay for any balance of payments benefits claimed to be derived from greater home food production. Many British economists accept this argument, but such an argument assumes an exchange rate fixed and maintained at the present level. Apparently maintaining the stature of the Pound is worth inefficiency in agriculture. The goods and services drawn by the subsidy into agriculture could, one would think, be more profitably invested in those industries in which Britain is pre-eminent, thus enabling Britain to increase its exports and import cheaper food from overseas. To the British the problem is not this simple. The materials and man-power used in agricultural production, it is claimed, are by no means freely interchangeable with those used in other sectors of the British economy. But if these resources have any positive marginal

opportunity cost at all, it would increase Britain's efficiency to cease subsidies to agriculture and treat the low-income problem as one of income redistribution, which it quite properly may be.

Now let me address the remainder of my comments specifically to Professor Thomas' paper.

Professor Thomas has ably described the operational changes in British agricultural support policy since World War II. He has emphasized that the purpose of the program is to stabilize agriculture as a whole, albeit the level at which the agricultural industry is to be stabilized is not at all clear. However, Mr. Thomas has failed to disclose explicitly that which is obvious from his paper, namely, the complete reorientation of the British program since 1945.

The immediate post-war years are characterized as years of "food shortage," but of course in economics a shortage is only meaningfully defined with respect to a price, and the very existence of a shortage implies a price that is set too low.

Nevertheless, this shortage was subsidized, both a "consumer" and a "producer" subsidy, says Thomas. Now this is a rather interesting distinction in and of itself (and I should like to hear someone explain it sometime). If Mr. Thomas is distinguishing between finite and infinite elasticities of supply, I should like him to say so.¹ Incidentally, the already-murky water is even more muddled in the next sentence where Thomas speaks of "prices" and "availability" of "total food supplies" as independent entities. Where at first he seems to be worrying about the elasticity of supply, he promptly denies the existence of the supply function!

By 1953 the "food shortage" had been transformed into a food surplus (a little embarrassment we all feel on this side of the water). While before it was thought necessary to ration food because of a lack of faith in the market, the British government now faced a surplus, which should have embarrassed Britain. This, of course, is purely academic, and besides the law of supply and demand had been repealed anyway. Well, almost so; if repealed completely, we couldn't explain the need for non-price rationing.

So in 1954 "deficiency payments" were instituted in order that, among other things, "if there were a really severe slump in world agricultural prices, the government will not, at least, lack the constitutional powers to shelter British farmers from it."

But it becomes obvious that a *fall* in agricultural prices is not what really worries the British agricultural policy makers, nor Mr. Thomas, for that

¹ If the elasticity of supply is infinite, no subsidy accrues to producers. As that elasticity becomes finite, a subsidy will be capitalized into specific factors. When the elasticity is zero, the subsidy becomes a pure rent or redistribution.

matter. For the ultimate justification of deficiency payments is not as a guaranteed annual wage for agriculture, but rather a hedge against Malthusia. For Mr. Thomas clearly states that, while letting British agriculture run down would enable Britain to take advantage of a short-run favorable balance of trade, he wonders what happens to a "country not producing all its food and raw materials . . . if later these terms of trade move in a less favourable direction." The only interpretation I can reasonably attribute to Mr. Thomas is that he expects, along with the British agricultural policy makers, that the relative price of food and fiber will rise, and perhaps fairly soon. At least soon enough that Britain should be expending resources to build up the productive power of agriculture right now.

The real change in British farm support policy, then, has been from a questionable, misguided policy of trying to make food at once cheap and plentiful at a time when much of the world's agriculture was incapacitated by the war, to a policy of "selling short" on Malthusia. Thomas implicitly accepts this interpretation of the turn of events, which, I might add, appears most illogical at a time when we are experiencing previously unsurpassed rates of growth in agricultural productivity.

REVISIONS OF THE PARITY INDEX

Chairman: G. W. Hedlund, Cornell University

THE 1959 USDA INDEX REVISIONS AND SOME RELATED POLICY QUESTIONS

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THE use of index numbers of price, production, or income as guide posts in policy formulation has become so widespread as to be almost a commonplace. For example, the Parity Index is used to determine parity prices and so to determine support levels for National farm programs; the Consumers' Price Index is used to escalate wage contracts; and the Wholesale Price Index is used as a conditioning factor in various contractual arrangements. Moreover, land purchase agreements and mortgage contracts use Price Indexes to provide flexibility in payment schedules, and we have no way of knowing how many other similar applications there may be. Such specific uses are in addition to the more general uses of such statistical measures as parts of analyses which directly or indirectly condition thousands of decisions by farmers, businessmen, and policymakers the country over.

In this connection many of us—even statisticians and economists—take our indexes for granted. Perhaps we have come to look upon them much as we look on our automatic automobile transmission—something that is simply there, relieving us of the necessity for paying much attention either to it or to its functions.

At any rate, it has been some time since the professional economic and statistical associations have given much attention to the several indexes that are widely used in the administration of our economy. I think this is not altogether fortunate, for these measures play a sufficiently important part in the lives of all of us to deserve continuing attention on the part of the professional statistical and economic association. It is heartening to see that the Office of Statistical Standards of the Bureau of the Budget has engaged the National Bureau of Economic Research to make a survey of at least part of this field.

Quite possibly some of the complacency concerning these measures arises from the belief that all—or at any rate most—of the theoretical problems of price and quantity measurement have been solved, and that the index number makers have merely a housekeeping function to perform. Although I would deny that there is more than a modicum of truth behind

this assumption, it is my conviction, irrespective of the degree of control that may characterize theoretical matters, that not all the practical problems are completely in hand, and that eternal vigilance is as necessary here as in other areas of our economic and political life.

The 1959 Revisions

To provide a setting for reviewing some of the more important problems of this type that are before us in the mid-Twentieth Century, I should like briefly to outline the 1959 revision of the Index of Prices Paid by Farmers including Interest, Taxes, and Farm Wage Rates (often—and hereinafter—referred to as the Parity Index) and the Index of Prices Received by Farmers. For those who wish to study the revision in detail I commend the combined April-July issue of *Agricultural Economics Research*,¹ in which the revisions are described in considerable detail. Some may also be interested in the published hearings before the Agricultural Subcommittee of the House Appropriations Committee.²

First let it be said that the 1959 revision of the Parity Index gives us, for the first time in nearly a quarter of a century, an index that is reasonably current in its weighting pattern and that—as a composite measure of the changes in prices of things farmers buy—reflects in its weights a close approximation to the current expenditure pattern of farmers.

The revision did not change the general structure nor the base period for either the Parity Index nor the Index of Prices Received. The revision updated the weighting structure and commodity consist of the indexes; and linked the revised section to the earlier portion as of September 1952.

The Parity Index: Survey of Expenditures

Taking up first the Parity Index, the primary basis for revision of weights and commodity consist was the Survey of Farmers' Expenditures in 1955 made in the spring of 1956 by the Agricultural Marketing Service in cooperation with the Bureau of the Census.³ Details of food expenditures were supplemented by the nationwide food survey conducted in the spring of 1955 by the Agricultural Research Service and the Agricultural

¹ Stauber, B. R., Hale, R. F., and Peterson, Byron S., "The January 1959 Revisions of the Price Indexes," *Agricultural Economics Research*, Vol. XI, No. 2-3 (April-July 1959), pp. 33-79.

² U. S. Congress: *Hearings before the Subcommittee of the Committee on Appropriations*, 86th Congress, First Session, Part I. 1959.

³ U. S. Department of Commerce and U. S. Department of Agriculture: *Farmers' Expenditures for Farm Living and Production*, Vol. III, Pt. II, 1954 Census of Agriculture, Dec. 1956.

U. S. Department of Commerce and U. S. Department of Agriculture: *Farmers' Expenditures in 1955, by Regions*. USDA Statistical Bulletin 224. April 1958.

Marketing Service.⁴ In addition to these two surveys various official information was used, particularly data on interest on farm real estate indebtedness, taxes on farm real estate, and annual estimates of fertilizer consumption prepared by the Agricultural Research Service; and data on sales of livestock prepared by the Agricultural Marketing Service. Collectively, we believe, these sources represent the most satisfactory set of basic information ever available for use in determining weights for the Parity Index.

Time does not permit a detailed description of the Survey. It was conducted on a stratified probability sample design with stratification first by the usual Census Regions, except that the New England and Middle Atlantic States, together with Delaware and Maryland, were combined to form a Northeastern region. Within geographic regions counties were grouped into 306 strata of approximately equal size in terms of expected number of sample farms, and as nearly uniform as possible in terms of type of farming. One primary sampling unit (usually a single county) was selected at random from each stratum.⁵

The number of questions it was necessary to ask was so great that it was concluded it would be wise to divide the survey into two parts. After considering various methods of dividing the questionnaire it was concluded best to use one questionnaire for living expenditures and one questionnaire for production expenditures. Inasmuch as information on production expenditures was to be utilized in connection with farm income analysis as well as for the Parity Index, a larger number of farms was selected for the production group than for living, the proportion being approximately 60-40.

Sampling rates were determined for each of 3 income groups for each type of questionnaire in each primary sampling unit. Individual farms were selected by random numbers from the 1954 Census, at the assigned sampling rates, in an effort to secure optimum allocation. These sampling rates were used in determining the expansion factors, so that the survey, when expanded to the regional and U. S. level, would provide unbiased estimates of the various expenditures. Figure 1 presents a map showing the counties represented in the survey. Generally from 30 to 50 farms were surveyed in each county.

The survey gave 6,715 usable questionnaires for production expenditures and 3,845 for family living. These were reviewed, edited, and tabulated by the Bureau of the Census in cooperation with the Agricultural Marketing Service.⁶

⁴ U. S. Department of Agriculture: *Food Consumption of Households in the U. S.*, Household Food Consumption Survey, 1955, Report No. 1.

⁵ Houseman, E. E., "Sample Design for the Survey of Farm Operators' 1955 Expenditures," *Estadística*, Vol. XV, No. 56, September 1957, pp. 591-600.

⁶ Stauber, Hale, and Peterson. *Op. cit.*

TABLE 1. FOOD AND TOBACCO PRICES PAID BY FARMERS: REVISION OF INDEX COVERAGE AND WEIGHTS, UNITED STATES, BASED ON EXPENDITURES FOR PURCHASED FOOD AND TOBACCO USED AT HOME, SPRING OF 1955¹

Commodity coverage	Expenditures for index items including imputations		Imputations	
	Per week	Annual	Item	Weekly expenditures
	Dollars	Dollars		Dollars
Grand total.....	16.38	851.76		
Total allocated.....	14.70	764.40		
Food.....	13.70	712.40		
Tobacco.....	1.00	52.00		
Unallocated.....	1.68	87.36		
Sweets.....	.92	47.84	Sugar, all.....	0.52
Sugar, white granulated.....	.52	27.04	White.....	.49
			Granulated.....	.45
			Powdered.....	.04
			Brown.....	.03
Table sirup.....	.21	10.92	Sirup.....	.09
			Corn, cane.....	.06
			Maple, sorgo.....	.03
			Molasses.....	.02
			Honey.....	.01
			Jellies.....	.04
			Jam.....	.05
Candy, nonchocolate.....	.19	9.88	Candy.....	.19
			With nuts.....	.06
			No nuts.....	.13
Cereal and bakery products...	3.02	157.04	Bread.....	.79
Bread, white.....	1.19	61.88	White.....	.70
			Whole wheat.....	.06
			Other.....	.03
			Rolls.....	.05
			Ready-to-eat.....	.03
			Brown and serve.....	.02
			Biscuits.....	.01
			Cakes.....	.10
			Pies.....	.02
			Doughnuts, etc.....	.22
Soda crackers.....	.14	7.28	Crackers.....	.14
			Sweet.....	.03
			Soda.....	.11
Flour, white.....	.90	46.80	Flour.....	.65
			White.....	.64
			Other.....	.01
			Flour mixes.....	.15
			Pancake.....	.02
			Cake.....	.10
			Biscuit.....	.02
			Other.....	.01
Baking powder.....	.18	9.36	Prepared (Jello) puddings...	.10
			Leaveners.....	.07
			Yeast.....	.02
			Other.....	.05
			Seasoning.....	.11
			Salt.....	.04
			Other.....	.07
Cornmeal.....	.15	7.80	Meal.....	.13
			Grits.....	.02
Oatmeal.....	.09	4.68	Hot cereals.....	.09
			Oatmeal.....	.06
			Wheatena.....	.03
Macaroni.....	.15	7.80	Macaroni.....	.08
			Rice.....	.07

¹ Sample page of work table.

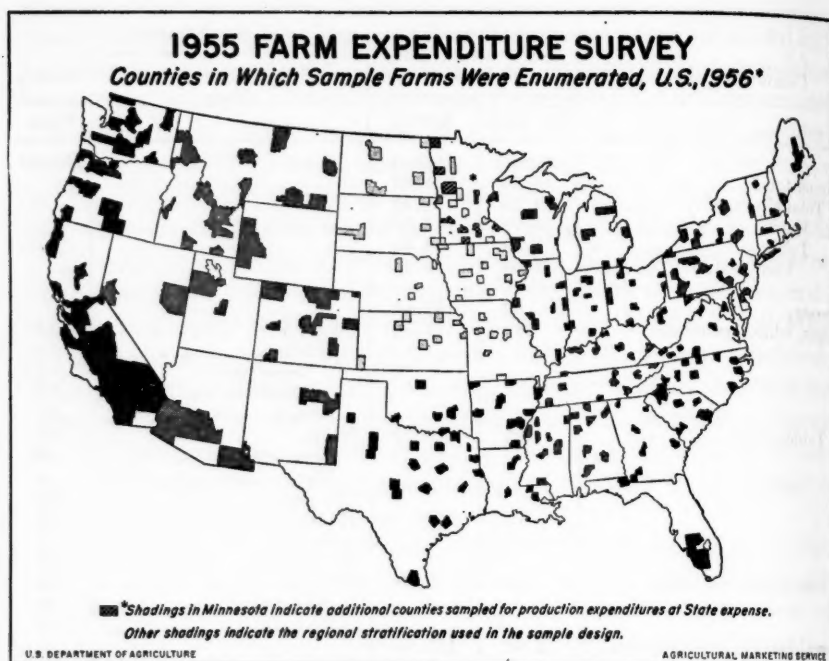


FIGURE 1

Matching with price series

After the survey had been summarized, the expenditures for the various survey categories were rearranged into the index groupings and the per farm expenditures totalled for the various index groups. Although the Survey reported expenditures for around 2,500 items, with amounts ranging from substantial to trivial, price series were not available for each item reported and it was next necessary to match the expenditure items from the survey against the price series available. Table 1 shows a sample from the worksheets at this stage.

It will be noted for example on the left side of the table that for the item "white granulated sugar" a total of 52 cents per week or \$27.04 on an annual basis, has been entered. White granulated sugar is an item for which we have a price series, but not all expenditures for sugar were for white granulated sugar. The right side of the table shows that the 52 cents is made up of 45 cents spent for white granulated sugar, 4 cents for white powdered sugar, and 3 cents for brown sugar. We do not have price series for powdered sugar nor for brown sugar; therefore, we have *imputed* to white granulated sugar the expenditures for these other types of sugar, giving a total of 52 cents per week. Similarly, expenditures for white bread, whole wheat bread, cake, pie, doughnuts, etc. were imputed to white bread; and similarly thru the entire list.

There were some expenditure items for which price series were not available, *and* which were not sufficiently closely related to items for which price series were available to be imputed directly to them. Poultry, tomato juice, catsup, pickles, melons, fresh strawberries, are examples. For food, such unallocated items totalled \$87.36 out of a total food expenditure of \$851.76. The weight for these was imputed to the food groups as a whole, but not to individual items. In other words, a group index is computed from the items for which price series are available, but the weight in the total index is proportionate to expenditures for all expenditures for the group.

It was necessary also to decide whether some of the available price series would be continued in or added to the index and whether some should be dropped, for in some cases we had been collecting prices for items for which the Survey reported trivial expenditures. For this purpose the same criteria was used generally as in the 1950 revision, namely, a price series for a commodity which accounted for $\frac{1}{2}$ of 1 percent of the total expenditures for the group of which it was a part was retained. If it accounted for less than $\frac{1}{2}$ of 1 percent it was dropped, on the assumption that resources should be directed insofar as possible to retain items which were most important in the expenditures of farmers and not to waste time and money on items which were of trivial importance. There were two or three minor exceptions to this general rule.

As a result of this review 120 new series were added to the index; 16 series were substituted for 9 previously in the index, and 62 items previously in the index were dropped on the criterion that no one of them contributed as much as $\frac{1}{2}$ of 1 percent of the total expenditure of the group to which it belonged.

The most important single addition was a series on used car prices. Since the expenditure survey indicated that approximately $\frac{1}{2}$ of the money spent by farmers for automobiles was spent for used automobiles, this is certainly a significant item. But it posed somewhat of a problem, in that, as of 1952, used cars were, rather more than most commodities, affected by the seller's market which prevailed during the Korean war. As a consequence, for some years used car prices declined rather more sharply than many other commodities. Accordingly, it was decided not to introduce used cars until 1955 inasmuch as to have introduced them earlier would have resulted in distortion.

Determination of weights

Table 2 shows the worksheet on which expenditures for each commodity (with imputation) were divided by the average price for 1955 to get the per farm quantity weights. Thus our item of \$27.04 for sugar was divided by \$1.04, the average price paid per 10 pounds in 1955, to arrive at 26

TABLE 2. FOOD AND TOBACCO PRICES PAID BY FARMERS: DERIVATION OF REVISED COMMODITY INDEX WEIGHTS, BASIS FOOD CONSUMPTION AND FARM EXPENDITURE SURVEYS FOR 1955, UNITED STATES

Item	Annual ¹ expenditures per house- hold, 1955	Average price paid, 1955	Average amount bought ¹		Distribution of 1955 expenditures		
			Quan- tity	Unit	Actual	Basis current index	
						Price× 1937-41 wt.	Rela- tive
	Dollars	Dollars	Number		Percent	Dollars	Percent
Sweets.....	47.84				6.2	36.58	7.0
Sugar.....	27.04	1.04	26.0	10 lb.	3.5	20.49	3.9
Sirup.....	10.92	.161	67.8	Lb.	1.4	13.04	2.5
Candy.....	9.88	.328	30.1	Lb.	1.3	3.05	.6
Cereal and bakery products	157.04				20.5	130.44	24.8
Bread.....	61.88	.173	358.0	Lb.	8.1	35.81	6.8
Crackers.....	7.28	.272	26.8	Lb.	1.0	5.63	1.1
Flour.....	46.80	2.14	21.9	25 lb.	6.1	50.17	9.5
Baking powder.....	9.36	.228	41.1	Lb.	1.2	7.37	1.4
Cornmeal.....	7.80	.074	105.0	Lb.	1.0	12.74	2.4
Oatmeal.....	4.68	.142	33.0	Lb.	.6	5.63	1.1
Macaroni.....	7.80	.227	34.4	Lb.	1.0	2.64	.5
Cornflakes.....	11.44	.291	39.3	Lb.	1.5	10.45 ²	2.0
Meat and fish.....	173.68				22.7	107.54	20.4
Round steak.....	41.08	.776	59.6	Lb.	5.4	35.02	6.6
Hamburger.....	19.24	.412	53.0	Lb.	2.5	8.60	1.6
Bacon, sliced.....	24.96	.552	54.6	Lb.	3.3	12.59 ³	2.4
Ham.....	16.12	.613	30.5	Lb.	2.1	6.31	1.2
Pork chops.....	9.88	.669	15.5	Lb.	1.3	6.82	1.3
Sausage.....	9.36	.490	19.1	Lb.	1.2	3.96	.8
Frankfurters.....	13.00	.492	26.4	Lb.	1.7		
Bologna.....	21.32	.488	43.7	Lb.	2.8	13.08	2.5
Salmon.....	18.72	.569	32.9	Lb.	2.4	21.16	4.0
Dairy products and eggs.....	118.56				15.6	45.12	8.6
Butter.....	19.76	.708	27.9	Lb.	2.6	18.84	3.6
Cheese.....	20.28	.562	36.1	Lb.	2.7	11.90	2.3
Evaporated milk.....	36.40	.160	228.0	Lb.	4.8	3.81	.7
Whole milk.....	31.20	.227	137.0	Qt.	4.1	7.84	1.5
Eggs.....	10.92	.558	19.6	Doz.	1.4	2.73	.5
Vegetables.....	81.64				10.8	52.70	10.0
Potatoes.....	23.40	.501	46.7	10 lb.	3.1	15.06	2.8
Beans, Navy.....	8.32	.170	48.9	Lb.	1.1	7.79	1.5
Cabbage.....	10.40	.071	146.0	Lb.	1.4	5.14	1.0
Lettuce.....	13.52	.196	69.0	Head	1.8	5.32	1.0
Tomatoes.....	5.72	.250	22.9	Lb.	.7	8.29	1.6
Corn, canned.....	9.88	.162	61.0	Lb.	1.3	7.23	1.4
Peas, canned.....	10.40	.177	58.8	Lb.	1.4	3.87	.7
Fruit.....	44.72				5.8	54.66	10.4
Apples.....	6.24	.153	40.8	Lb.	.8	28.20	5.4
Bananas.....	12.48	.174	71.7	Lb.	1.6	9.07	1.7
Oranges.....	26.00	.480	54.2	Doz.	3.4	17.39 ⁴	3.3
Fats and oils.....	40.04				5.2	20.96	4.1
Lard.....	8.84	.199	44.4	Lb.	1.2	9.20	1.8
Vegetable shortening.....	6.76	.321	21.1	Lb.	.8	2.47	.5
Salad dressing.....	10.40	.324	32.1	Lb.	1.4	3.79	.7
Peanut butter.....	6.76	.470	14.4	Lb.	.8	4.10	.8
Margarine.....	7.28	.287	25.6	Lb.	1.0	1.40	.3
Beverages.....	48.88				6.4	53.87	10.2
Coffee.....	42.12	.924	45.6	Lb.	5.5	48.97	9.3
Tea.....	6.76	1.53	44.2	Lb.	.9	4.90	.9
Tobacco.....	52.00				6.8	23.46	4.5
Cigarettes.....	41.00	.227	183.0	20	5.4	9.92	1.9
Smoking tobacco.....	10.40	1.17	8.89	Lb.	1.4	13.54	2.6
Total.....	764.40				100.0	525.33	100.0

¹ Including imputations.

² Including wheat flakes and rice.

³ Including salt pork.

⁴ Including lemons and grapefruit.

units of 10 pounds each, which is the pricing unit. The total of \$61.88 for bread was divided by 17.3 cents to give 358 pounds of bread, which is the index weight. This process, with in some cases slight modifications to meet particular circumstances, was carried through for all index commodities to derive the physical quantity weights.

So far we have discussed two types of imputation: (1) the case in which weights for individual items generally resembling an index item were imputed to the index item, and (2) the case in which items not imputed to a particular index item were imputed to the group as a whole.

There is another type of imputation which was made on a still more general basis. Farm families were reported by the survey to have spent \$1,144,000,000 for medical expenses, \$409,000,000 for insurance, \$328,000,000 for recreation, \$523,000,000 for gifts and contributions. In the same way on the production side \$567,000,000 went for machine hire and custom work; \$509,000,000 went for marketing expenses for crops and livestock; \$514,000,000 went for cash rent and irrigation, and fire and other business insurance accounted for something like \$155,000,000. None of these are represented by price series, for the reason that it has not been possible to include them in the current price collection program. They are, nevertheless, actual expenditures and as such have been included in the respective totals for living and production from which the percentage weights for combining the group indexes have been derived.

Table 3 presents a summary of the expenditure allocation. In the first column is shown the expenditures by groups for individual items together with direct imputations. The second column shows the additional imputations to the group; the third column shows the sum of columns one and two. The fourth column shows column 3 expanded to allow for the type of expenditures for which there are no group indexes—medical expenditures, personal insurance, etc. on the living side, and marketing expenses, business insurance, etc. on the production side, so as to include them in the overall balance between living and production, interest, taxes, and wage rates.

The fourth column represents the 1955 level of expenditure allocations by index groups, including all imputations, and the last column is the percentage distribution which is used for the group weights. The level of expenditures in 1955 was far greater for all index categories than in the previous weight base period 1937-41, but the increases were by no means uniform. Table 4 presents a summary of the distribution of expenditures among the various index categories as used in the 3 weight periods 1924-29, 1937-41, and 1955. It will be noted that in 1955 a larger proportion of total expenditures was indicated as going for production than in the 1937-41 period and a smaller percentage went for living, interest, taxes and wages.

TABLE 3. FARM EXPENDITURES: DOLLARS PER FARM, UNITED STATES, 1955¹

Expenditure group	Imputed to individual items	Imputed to individual groups	Total imputed to groups	Total expenditure	
				Actual	Relative
	Dollars	Dollars	Dollars	Dollars	Percent
Living total.....	2,201.48	419.50	2,620.98 ²	3,283 ³	39.50
Food and tobacco.....	764.40	87.36	851.76 ⁴	1,113 ⁵	13.40
Clothing.....	355.39	72.02	427.41	527	6.34
Household furnishings.....	254.88	14.70	269.58	332	3.99
Household operations.....	297.36	90.12	387.48	480	5.77
Building material, house.....	177.91	98.05	275.96 ⁶	363 ⁷	4.37
Auto and auto supplies.....	351.54	57.25	408.79 ⁸	468	5.63
Production total.....	3,072.64	546.12	3,618.76	4,237 ⁹	50.90
Feed.....	801.73	106.90	908.63 ¹⁰	1,064	12.80
Livestock.....	327.00		327.00 ¹¹	383	4.60
Motor supplies.....	487.59	109.57	597.16 ⁸	699	8.39
Motor vehicles.....	311.75		311.75 ⁸	365	4.38
Farm machinery.....	261.31	109.33	370.64	434	5.21
Building and fencing materials.....	220.70	148.82	369.52	433	5.20
Fertilizer and lime.....	291.52		291.52	342	4.11
Farm supplies.....	228.84	32.22	261.06	305	3.66
Seed.....	142.20	39.28	181.48	212	2.55
Total living and production.....	5,274.12	965.62	6,239.74	7,520	90.40
Interest.....				80 ¹²	.96
Taxes.....				171 ¹²	2.04
Total commodities, interest, and taxes.....				7,771	93.40
Wage rates.....				548	6.60
Grand total.....				8,319	100.00

¹ Basis Farm Expenditure Survey for 1955, the Household Food Consumption Survey, and related estimates of the Agricultural Marketing Service and the Agricultural Research Service. Relative expenditures (percent) for Living; Production; Living and Production combined; and Living, Production, Interest, and Taxes all rounded to 3 significant digits.

² Excludes expenditures of \$594 per farm family for medical expenses; haircuts, beauty shop and other personal services; movie and other admissions; other recreational expenses; personal insurance; gifts and contributions; and other miscellaneous expenses which were distributed proportionately to each living expenditure group; also \$35 equalization adjustment basis supplementary survey indications, namely a \$49 deficiency in the Household Food Consumption Survey, a \$17 expenditure for lodging away from home, and a \$31 increase in the family living portion of auto expense based on combined returns from both the living and production component of the Farm Expenditure Survey.

³ 101.015 percent of \$3,250 (2621+594+49+17-31) placing expenditures per family on a per farm basis.

⁴ Allocations based on independent and detailed data from Household Food Consumption Survey for 1 week in the spring of 1955.

⁵ Based on Farm Expenditure Survey; includes expenditures for food away from home.

⁶ Excludes expense of vacation housing, lodging at school, etc., interest and taxes on owner-occupied dwellings.

⁷ Excludes taxes (\$39) and mortgage interest (\$20) on owner-occupied dwellings.

⁸ Estimate based on indications from farm production and family living surveys.

⁹ 117.084 percent of \$3,618.76 to include allowance for expenditures for machine hire and custom work, veterinary services, insurance, marketing costs other than feed fed at markets, etc.; subgroup totals are increased proportionally.

¹⁰ Includes cost of feed fed at markets.

¹¹ Based on purchases of feeder and stocker livestock and poultry excluding interfarm sales within States, as estimated by Agricultural Economics Division, Agricultural Marketing Service.

¹² Based on estimates of the Agricultural Research Service.

TABLE 4. GROUP WEIGHTS: INDEX OF PRICES PAID BY FARMERS,
INCLUDING INTEREST, TAXES, AND WAGE RATES

Item	Weight base period		
	1924-29 ¹	1937-41 ²	1955 ³
	Percent 41.2	Percent 44.0	Percent 39.50
Living.....			
Food (including tobacco ⁴).....	14.8	16.7	13.40
Clothing.....	12.5	8.6	6.34
Autos and auto supplies.....	4.5	6.9	5.63
Household operations.....	3.9	5.9	5.77
Household furnishings.....	2.4	4.0	3.99
Building materials, house.....	3.1	1.9	4.37
Production.....	36.4	41.2	50.90
Feed.....	10.1	10.2	12.80
Livestock.....	4.4	5.3	4.60
Motor supplies.....	3.9	5.2	8.39
Motor vehicles.....	3.9	5.2	4.38
Farm machinery.....	3.4	4.5	5.21
Building and fencing materials.....	3.7	2.7	5.20
Fertilizer and lime.....	2.7	3.1	4.11
Equipment and supplies.....	3.3	3.3	3.66
Seeds.....	1.0	1.7	2.55
Total commodities.....	77.6	85.2	90.40
Taxes.....	5.7	3.8	2.04
Interest.....	6.5	3.0	.96
Cash wage rates.....	10.2	8.0	6.60
Commodities, interest, taxes, and cash wage rates.	100.0	100.0	100.0

¹ 1910 to March 1935.² March 1935 to September 1952, inclusive.³ September 1952 forward.⁴ June 1935 forward.

As a consequence of the revision there was a net increase in the index coverage from 340 commodities to 389, some of which appear in more than one commodity group. Thus gasoline, autos, telephones, electricity, to mention a few, are represented in both the family living and production segments of the index; accordingly, such price series enter into an appropriate subgroup within both the living and production categories with the weights allocated proportionately. It should be noted that not all of these could be added in 1952, as some of the new series did not begin until after that date, and some did not begin until 1958. That was the year in which we were able for the first time to make use of the findings of the Expenditure Survey for the purpose of revising the commodity coverage in our pricing program.

Effective date

At this stage it was necessary to consider when the new weights would be given effect; whether, for example, they should be given effect as of

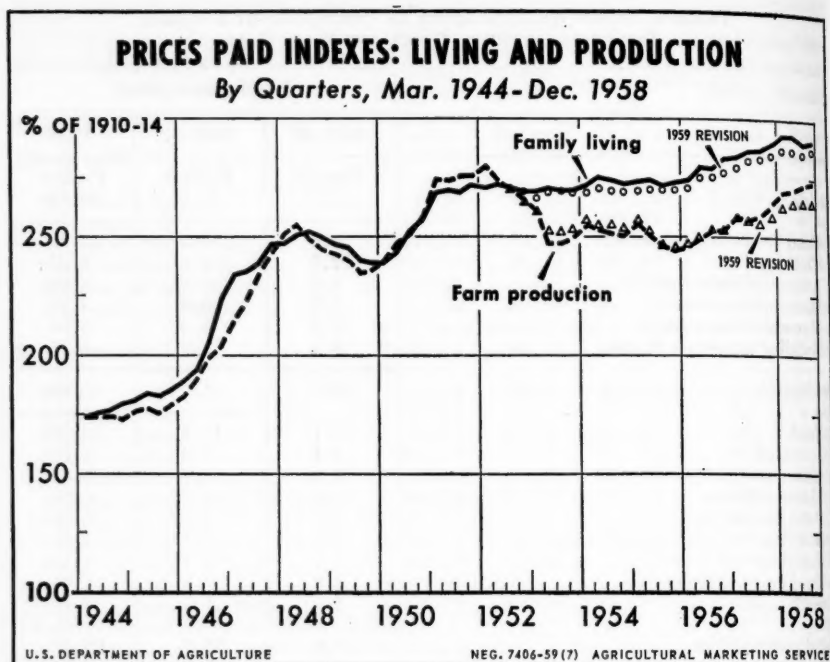


FIGURE 2

the date we completed the revision, or at some earlier date. It would have been possible to have linked the new index to the old in December 1958, and thus not have made the new weighting pattern effective until that time. This would have continued the use of 1937-41 weights for four years after 1955 weights became available, and seemed logically indefensible. Moreover, the change from 1937-41 expenditure patterns may be assumed to have come about gradually. Therefore, at some period between 1941 and 1955, the expenditure pattern presumably became more like 1955 than like 1937-41, and our link date should logically approximate that date.

A review of price relationships also seemed to support choosing an earlier date. From Figure 2 it will be noted that the living and production components of the index, which together account for something like 90% of farmers' expenditures, moved fairly closely together until 1952. At this time, owing largely to lower prices for feeder livestock and for feed, the production component diverged sharply from the living component. The 1955 survey was made after this divergence and rather clearly represents conditions after that divergence rather than before. Finally, many of the effects of the Korean war on the economy appear to have worked themselves out by 1952.

All things considered, then, September 1952 was selected as the date for linking the revised index to the old index, and the new weights were made effective at that time. The new weights, it will be remembered, give less weight to the living component and more to production; therefore, since the living component has been at a higher level in recent years than the production component, and is receiving less weight under the new weighting pattern, the revised index runs at a progressively lower level than the old.

The Index of Prices Received by Farmers

Turning now to the Index of Prices Received by Farmers, the changes resulting from the revision were of the same kind, but for the most part of lesser degree, than in the case of the Parity Index. Only two commodities were added, green peas for processing and asparagus. A third commodity, tangerines, which had formerly been included in combination with oranges, was broken out as a separate commodity. There were some changes made in the technical method of handling short season items and of weighting the fresh fruits and vegetables used for processing. Such changes were for the most part of minor importance and had as their main effect a slight diminution in the seasonal swing resulting from the price movements of these highly seasonal items.

The net effect of the weighting pattern (Table 5) was to increase slightly the overall importance of crops relative to livestock, and to shift slightly the relative importance of the individual groups. The net effect on the 10-year average, 1949-58, was a reduction of .8 of 1%, that is from 258 to 256. As in the case of the Parity Index the new weights were made effective as of September 1952.

Figure 3 presents the revised and unrevised indexes, together with the respective Parity Ratios.

The major difference between the prices received and prices paid revision was the use of a 5-year average, 1953-57, centered on 1955 as the weight period instead of the single year, for the reason that the information was available for using the 5-year average on the prices received side; moreover, generally speaking, it is likely that shifts from year to year in the importance of individual crops or groups of livestock products may be somewhat greater than in the case of prices paid, owing to weather, yields, etc. At any rate for the Prices Paid Index there was a survey for only the one year 1955 so that we were limited to that year. The same limitations did not apply for Prices Received and we took advantage of the availability of a broader base, maintaining the center however on 1955.

It should be noted that data on sales and production of farm products are collected currently as part of the regular Crop Reporting Service

TABLE 5. GROUP WEIGHTS FOR INDEX OF PRICES RECEIVED BY FARMERS¹

Commodity group	1924-29 weights			1937-41 weights			1953-57 weights		
	Average cash receipts	Percent weights of—		Average cash receipts	Percent weights of—		Average cash receipts	Percent weights of—	
		Groups	Total		Groups	Total		Groups	Total
	Thousand dollars	Percent	Percent	Thousand dollars	Percent	Percent	Thousand dollars	Percent	Percent
Crops:									
Food grains.....	885,705	18.6	8.9	551,935	16.6	7.0	2,161,788	17.5	7.9
Feed grains and hay.....	742,830	15.6	7.5	526,683	15.9	6.7	2,488,492	20.1	9.1
Cotton.....	1,970,443	28.9	13.9	654,504	19.7	8.3	2,282,890	18.5	8.4
Tobacco.....	255,171	5.4	2.6	290,254	8.8	3.7	1,121,863	9.1	4.1
Oil-bearing crops.....	233,619	4.9	2.3	237,943	7.2	3.1	1,335,961	10.8	4.9
Fruit.....	595,722	12.5	6.0	456,339	13.8	5.8	1,296,471	10.5	4.7
Commercial vegetables.....	345,674	7.3	3.5	376,764	11.4	4.8	1,137,337	9.2	4.2
Other vegetables.....	322,188	6.8	3.3	217,993	6.6	2.8	530,587	4.3	1.9
Total crop subgroups.....	4,751,352	100.0		3,312,415	100.0		12,355,389	100.0	
Other crops.....	441,351			387,412			1,275,590		
Total crops.....	5,192,703		48.0	3,699,827		42.2	13,630,979		45.2
Livestock and products:									
Meat animals.....	2,801,103	50.2	26.1	2,487,043	49.6	28.6	8,688,741	53.0	29.1
Dairy products.....	1,627,643	29.1	15.1	1,535,881	30.6	17.7	4,373,259	26.7	14.6
Poultry and eggs.....	1,060,591	19.0	9.9	881,886	17.6	10.2	3,204,531	19.5	10.7
Wool.....	96,555	1.7	.9	110,655	2.2	1.3	132,966	.8	.4
Total livestock and products subgroups.....	5,585,892	100.0		5,012,465	100.0		16,399,497	100.0	
Other livestock and products.....	39,791			44,417			156,044		
Total livestock and products.....	5,625,683		52.0	5,059,882		57.8	16,555,541		54.8
All farm products.....	10,818,386		100.0	8,759,709		100.0	30,186,520		100.0

¹ For combining the various subgroup indexes into an all-crop, an all-livestock and livestock products, and an all-commodity index, weights are Percentages based on average cash receipts received by farmers for the 3 periods 1924-29, 1937-41, and 1953-57.

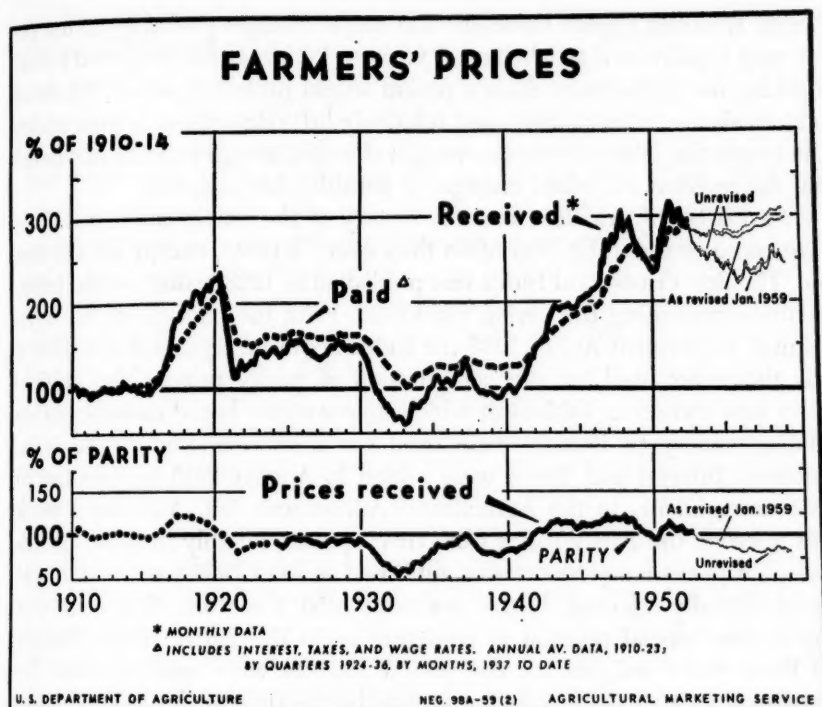


FIGURE 3

activities of the Department. This is not the case for the items bought by farm families, for which, although price data are collected currently, anything like complete information concerning expenditures by commodities and groups of commodities is available for the most part only at intervals and as a result of special and fairly expensive surveys.

Policy on Frequency of Revision

There are several rather basic issues that are highlighted by this revision. Perhaps the first, and in some respects the most basic, is how frequently should the weight pattern for an index be revised?

This is a point on which opinion differs. There are some, I believe, who would revise weights possibly every year—others would search for a "normal" or representative period, and hold onto it for a long time. For myself, bearing in mind that expenditure patterns represent the net resultant of a number of factors operating on many people, it seems that while technological change and developments in marketing practices tend to bring about shifts, they are working against a behavior pattern and against an income pattern, which, in their broad outlines, have much

inertia. It would appear therefore that major changes probably do not occur very rapidly so that I believe 5 years to be a reasonable period for re-checking our guideposts. Such a period would probably permit the shifts to be moderate in magnitude, and relatively little disturbing in their effect. The longer the interval between weight changes, the greater the likelihood that the revision will effect changes of considerable moment.

As a matter of practice, over the history of the Parity Index, revisions have come considerably less often than every 5 years, except for the first one. The first Prices Paid Index was published in 1928, using weight information representing the period 1920-1925. With the passage of the Agricultural Adjustment Act of 1933 the Index acquired legal status in that it was thereafter used for the computation of parity prices. The original index was revised in 1933-34 at which time weights based on information relating mainly to 1924-29 were used for combining the various commodities. Interest and Taxes were added in August 1935 in response to 1935 amendments to the Agricultural Adjustment Act. Additional work was done on the Parity Index from time to time, notably in 1936, and although a preliminary report was published in May 1939 the revision was never officially adopted. It was not until 1950, therefore, that there was any further official revision of consequence in the Parity Index. During all these years weights for the period 1924-29 were used, so that the weights were a good 20 years out of date by the time of the 1950 revision.

When we came to the 1950 revision the latest information available for weighting purposes was provided by two surveys—one near the beginning of the 1937-41 period and one near the end—so that after completing the 1950 revision we were still nearly 10 years out-of-date. The technical committee which had supervised the revision process recommended in its report that steps be taken immediately to secure new and up-to-date weight information. In fact an item was included in the 1951 budget of the Department, but it was not until 1955 that funds for a new survey were available. By the time the revision was accomplished (January 1959) the old weights were 18 years out-of-date. Thus, for the first time since 1933, we have a Parity Index that is approximately current and representative of modern expenditure patterns.

If the past is any guide, it is time now to think about the next revision.

If there is any validity to the school of thought that indexes should be updated every 5 years then might it not be desirable to establish a pattern for index revisions similar to that governing the taking of the Census? If such a pattern or precedent could be established, it would take much of the heat off the administrators and the budget makers in trying to decide at a particular time whether the index is sufficiently in need of revision to take precedence over some other urgent project. Unless such a precedent

can be established the prospect for securing index revisions at anything like reasonable intervals seems very bleak.

A second decision of considerable consequence has to do with whether in making such a revision the weighting pattern should be given effect retroactively or only in prospect. In all of the revisions of the Parity Index that have been made heretofore the weighting pattern has been made effective retroactively. This was true in 1933. It was also true in 1950 at which time the new weighting pattern was made effective in 1935 and the index generally was revised all the way back to 1910. In 1959, however, since there were no structural changes in the index, since a generally thorough revision had been made in 1950, and since no new series extending into the earlier period had been developed, there was no basis for carrying the revisions back to the beginning. The question at issue was, how far back should they go, and this as I have indicated was decided in favor of the 1952 date. If, however, a policy can be established of making revisions on a periodic basis at intervals of not more than 5 years, the problem of whether to make the weights effective retroactively would doubtless become less critical since in any case only a short time interval would have elapsed since the last revision. When, however, the intervals between revisions are long and irregular, the likelihood of substantial shifts in the distribution of expenditures exists, and the question of making the weights effective retroactively will continue to plague whoever is responsible for the decisions.

Coordination of Indexes

A third question of somewhat broader moment may also be raised. In the field of agricultural policy the Parity Index and its companion, the Prices Received Index, are widely used for administrative purposes and for policy decisions. In a somewhat similar manner the Consumer Price Index is used in the industrial area. In this case, however, the usage is more by industry and labor in negotiating wage contracts than on the part of the government itself. We thus have two indexes both used widely for administrative determinations affecting the public good in extremely critical manners. However, coordination with respect either to the basic reference period or the period selected for the weighting pattern has been of an extremely limited character. Possibly it can be argued that there is no necessary reason why weights should be derived from the same period for both these indexes. On the other hand, I venture the view that comparisons would be more useful, more meaningful, and more reflective of the true economic situation if the weighting pattern of these two indexes related to the same period, and were based upon data representing appropriate parts of a uniform cross-section of the whole population, instead

of upon partial surveys at different times. I might go further and suggest that the Wholesale Price Index and the Federal Reserve Index of Industrial Production might also well be geared to the same period.

Under the leadership of the Office of Statistical Standards of the Bureau of the Budget there have been some moves in the direction of a common reference base, and there have been conversations looking to some unified cross-section surveys.

Not many years ago the Office of Statistical Standards requested that all indexes be based on the period 1947-49 and that weight information insofar as possible should be derived from that period. The agricultural indexes, of course, having been tied to a 1910-14 base by law and having no weight information relative to 1947-49 could not be revised; however, they were converted to a 1947-49 base for purposes of reference and currently published on that base as well as on the official legal base. So long as the law remains unchanged this is probably as far as an administrative agency can go, but the question still persists and may well come up for discussion before technical groups such as this. In the long run possibly the technical views may prevail.

I leave with you, then, the question as to whether there may not be a need now for some rethinking of the problem of revisions. Has not our dependence upon indexes reached a point such that we are justified in asking that their revision be placed on a regular and recurrent basis; have we not reached a point at which our major indexes should be based on a common weight base; and have we not reached the point at which they should all be based on a common reference point?

PARITY PRICES IN THEIR ECONOMIC CONTEXT

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WE HAVE been asked to discuss the broad implications of the parity price concept from the standpoint of agricultural programs and policy. In doing so we will comment only briefly on statistical problems and place major emphasis on those considerations that are important for policy. As a guide for policy, we will attempt to identify some equilibrium prices, using corn as the focal point.

The official price report of the United States Department of Agriculture released on January 30, 1959, shifted the weights of the parity index from 1937-41 forward to 1955. The weighting pattern for the prices-received index was shifted forward from 1937-41 to 1953-57. Both indexes were then recalculated back to September 1952 and chained into the indexes previously calculated, in order to relate the entire index series to the major reference base of 1910-14. The effect of these revisions was to lower the current parity index by slightly more than four percent. The current prices-received index was lowered by slightly less than one percent. The combined or net effect was to raise the parity ratio and thus to lower the effective support level for commodities by approximately three and one-third percent. The chief reason for this decline was the heavier weighting of production as compared with consumption items in 1955 than in 1937-41 which, with relatively lower prices for production items, moved the support level downward.¹

Although the revision required a change in price supports for all those commodities supported at a given percentage of parity, the change for many commodities was smaller than had been made on other occasions simply by changing the percentage of parity at which a given commodity is supported. During the seven years from 1953 through 1959 price supports for major storable commodities—especially feed grains—had moved steadily downward toward what we think is a position of long-run market equilibrium. The national average price support for corn dropped from \$1.60 a bushel in 1953 to \$1.12 in 1959. The support for barley dropped from \$1.24 a bushel in 1953 to 94 cents in 1955; it then rose to \$1.02 in 1956 and dropped again to 77 cents in 1959. Grain sorghum dropped from a high of \$2.43 a hundred pounds in 1953 to \$1.52 in 1959.

¹The House Subcommittee on Agricultural Appropriations examined the revision in detail and the chairman of the committee questioned USDA officials critically and at length. See *Department of Agriculture Appropriations for 1960, Hearings Before the Subcommittee of the Committee on Appropriations, House of Representatives, Subcommittee on Department of Agriculture and Related Agencies, 86th Congress, First Session, Part I, pages 85-250.*

Parity Prices From the Standpoint of Policy

Market prices at full production are the standard forcing the revisions in support levels. Changes were rationalizations of an adjustment of price supports to market equilibrium. In retrospect, between 1953 and 1959 production control programs, export subsidies, and soil conservation programs merely softened the impact or bridged the gap between levels of price supports and market equilibrium prices. The revisions in support levels could have been brought about without the aid of any specific price formula if they had been within limits set by legislation. Between 1953 and 1959 Congress and the administration in effect carried out a pricing program in which feed-grain prices were gradually adjusted to assumed market equilibrium prices under full employment. Thus there have been two types of adjustments in price support to adapt parity to market conditions. One involved a change in the percentage at which prices would be supported. The other was a change in formula.

Although some farm groups highly favor a program to control output sufficiently to achieve a given price level, it seems unlikely that we will develop more comprehensive production controls for agriculture. Although we have controls and above-equilibrium prices for wheat, tobacco, and some other products, after 30 years of effort in this direction a comprehensive control program for agriculture is still in the talking state. We have little evidence that comprehensive control programs would raise agricultural income substantially or hold any income gains over any significant period of time, such as a decade. We assume that a comprehensive control program would raise agricultural income for a year or two, but it would become increasingly expensive and would fail because of increasing expenses and growing pressure of farm technological advances. The different programs desired by commodity groups will not have an effect on agricultural production sufficient to raise the general index of prices received much above equilibrium levels over a long period, such as a decade.

A basic consideration for farm policy, therefore, reverts to the question of market equilibrium prices. How far is the current index of prices received above equilibrium levels? The question is vitally important in considering programs for the future. In this analysis we will concentrate on the equilibrium price for corn (1) because corn is the major feed grain and is representative of the entire feed-grain complex and (2) because feed grain is the marginal crop product of United States agriculture. As agricultural productivity increases in relation to nutritive requirements of the population, production resources are shifted from food crops to feed crops. By this shift, total caloric output is kept in line with caloric requirements. In the final analysis, individual agricultural prices, in the absence of production control, will arrange themselves around and in relation to

TABLE 1. FEED-GRAIN PRODUCTION AND USE, UNITED STATES,
FEED YEARS 1952-58

Feed year	Production for feed grains	Disappear- ance of feed grains	Carryover		Feed use of feed grains	Feed use per grain- consuming animal unit
			Year end	Change		
			<i>(Million tons)</i>			<i>(Tons)</i>
1952-53	119.7	112.8	27.0	+ 6.9	96.7	.609
1953-54	117.5	112.8	31.7	+ 4.7	99.9	.638
1954-55	123.9	116.5	39.1	+ 7.4	100.6	.623
1955-56	130.9	126.7	43.3	+ 4.2	106.2	.641
1956-57	130.2	124.6	48.9	+ 5.6	104.5	.646
1957-58	142.9	132.7	59.1	+10.2	112.1	.689
1958-59	157.7	150.0 ¹	66.8 ¹	+ 7.7 ¹	128.0 ¹	.744 ¹

¹ Forecast.

feed-grain prices. The question of equilibrium prices for corn is the heart of the question of level of agricultural prices generally.

What Is the Equilibrium Price for Corn?

Under conditions of average amount and distribution of rainfall, the long-run equilibrium price of corn is higher than the current support price. If feed grain price support programs remain unchanged, the market price of corn will exceed the support price and will generally be at the formula resale price over the next several years. That is, the support price on corn has been reduced below long-run equilibrium levels.

This proposition is generally based on the assumption that no further wheat lands will be diverted to feed grains or wheat to feed. However, the support price is probably enough below equilibrium to make it possible for the feed grain market to absorb substantial amounts of wheat production resources. There are three periods to be considered in support of this proposition: the crop years of 1952-56, 1956-58, and 1959-61.

The 1952-56 era. The reference data for the 1952-56 period are shown in Table 1. The carryover of feed grains from the 1951-52 crop year was 20.1 million tons, including 487 million bushels of corn. This is just about an ordinary commercial carryover. Production from the 1952 crop exceeded use in the ensuing feed year, and this imbalance has continued every year since (Table 1).

The question at hand is what would have happened to production, use, and price had there been no price support programs. The answers are necessarily conjectural.

A slightly smaller quantity of feed grains would likely have been produced. Land would have been diverted from wheat, cotton, and rice at a slower rate, although probably not much slower because wheat, cotton,

and rice have limited markets that are difficult to expand. More likely about the same amounts of these allotment crops would have been produced on more acres with lighter fertilization and less intensive cultivation.

It is doubtful that price programs for feed grains have had much direct effect on production. Without price supports possibly some land that has been in grain sorghums and barley would have reverted to grass. Compliance with corn acreage was not great. Some land was diverted from corn and oats to soybeans, but soybeans are 80 percent (by weight) feed. The fact is that it is difficult to find any very productive land that was taken out of production.

The real difference that the absence of programs would have made is in the utilization of feed. One thing is certain: Feed production and utilization would have been in balance. Feed would have sold at prices that would have made it possible to increase livestock production. No one but the United States government would have accumulated such a large inventory.

What price would have prevailed? To answer this question easily, we have made certain assumptions: (1) Production would have been about as it was, and (2) all of the adjustment would have been in hog production.²

Feed-grain disappearance for feed during the five crop years 1952-56 averaged 102 million tons. The best estimate is that 47 million tons were fed to hogs. The average accumulation was 5.4 million tons. Accordingly, feed for hogs would have averaged 52.4 million tons a year, or 11.5 percent more than was actually used.

During the five years 1952-56, pork production averaged 66.4 pounds per capita; 11.5 percent more is 74.0 pounds. Total meat consumption averaged 157.1 pounds per capita. Adding the increase in pork makes a total of 164.7 pounds, or a 4.8 percent over-all increase.

The price effects of additional meat production are uncertain. Estimates of elasticity of demand for meat at retail over a five- to ten-year period are in the general order -1.0.³ Admittedly, in the short run the demand for hogs at the farm is decidedly inelastic. But this result is not closely related to the question at hand. It has to do with the short run and with live animals; our proposition is with the long run and with meat.

On the basis of a unit elasticity of demand for meat at retail, and given time for adjustments between retail meat and live animal prices, we can logically argue that hog prices would have averaged 4.8 percent lower than they actually did during the five years in question. During the five-

² The second assumption is not literally true but does not affect the analysis. Most of the animal adjustment would have been in hogs.

³ See especially E. J. Working, *The Demand for Meat*, U. of Chicago, 1952.

year period the average price was \$18.46 per hundredweight for barrows and gilts at Chicago. Correction for a 4.8 percent increase in meat supply gives \$17.61 as the average at the higher production rate.

This calculation may be vulnerable on two counts: (1) Some people think the long-run elasticity of demand for meat at retail is less than -1.0 , and (2) the long-run elasticity of demand for hogs may be less than that for pork. As an alternative we used an elasticity of demand of $-.8$ for meat and the same absolute marketing margin as actually existed. By this method the resultant hog price was \$16.61.⁴

A hog-corn ratio of about 12 to 1 is apparently equilibrium. Thus, \$17.61 divided by 12, or \$1.47, gives the indicated five-year average price of No. 3 corn at Chicago. The alternative calculation yielded \$1.38. The price of No. 3 corn in Chicago averaged \$1.47 during the 1952-56 period.

The pattern of corn prices during the five-year period would have been different. Prices would have been lower at the beginning and higher at the end.

Looked at differently, the feed-grain production of the 1952-56 period would have permitted a per capita meat consumption of 164.7 pounds. The per capita consumption in 1956 was 166.7, two pounds higher than the average possible for the whole period. In 1956 the national average price of butcher hogs was \$14.75. This figure divided by 12 equals \$1.23, the national average farm price of corn. Because of a reduction in livestock numbers in 1956, the meat supply was unusually large in relation to livestock numbers; hence the impacts on hog prices were greater than would generally be expected with stable numbers.

The essential conclusion that we reach in examining the 1952-56 period is that all of the livestock needed to use up the entire feed-grain production could have been sold at prices that would have allowed corn prices to be substantially above the 1959 support rates.

The 1956-58 era. From 1952 through 1955, the reason for the accumulation of feed-grain inventories was the overpricing of corn. With the reduced support level, reduced corn acreage, and increased livestock numbers, the reason for the accumulation of inventories shifted, in 1956, to unusually favorable growing conditions. Had acreage and utilization remained as they actually were, under normal yield conditions there would have been a substantial liquidation of feed-grain inventories. Total production for the three years would have been 368.8 million tons and use 409.3 million tons, liquidating 40.5 million tons. Obviously, use would

⁴ A large number of demand studies is available for reference. For a review of several see, Richard J. Foote, "Price Elasticities of Demand for Nondurable Goods," paper prepared for Conference on Consumption and Economic Development, Universities-National Bureau Committee for Economic Research, October 21-22, 1955.

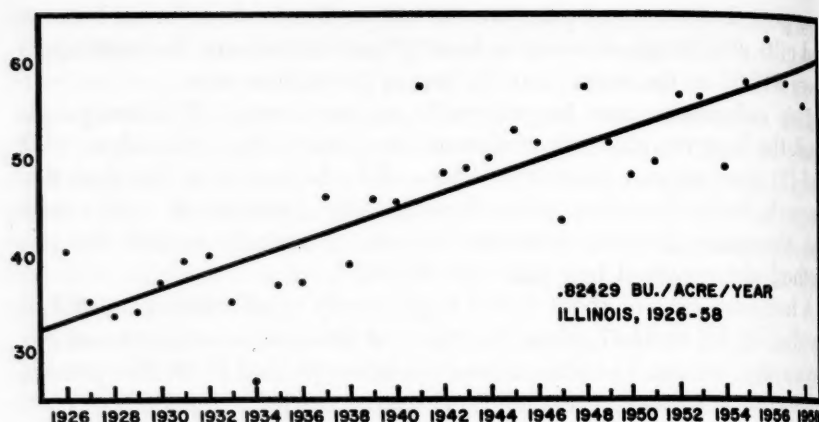


FIG. 1. NET REGRESSION OF ILLINOIS CORN YIELDS AND TIME AND UNEXPLAINED DEVIATIONS FROM TREND WITH RAINFALL TAKEN INTO ACCOUNT

have been smaller or acreage larger, because the inventory at the beginning of the period was only 43.3 million tons.

To develop the basis for this brash statement, we digress to a discussion of the concept of normal yields. In view of a rapidly developing technology, there is currently much discussion about normal yields for corn. During the past 20 years, corn yields have varied so much that a reasonable trend line cannot be cast through them. To reduce this variation, a multiple-regression analysis of Illinois corn yields, average rainfall in each of the months April through September, and time was made for the period 1926-58. Eighty-three percent of the variation in annual yield was thus explained.⁵ The regression value for time was .82 bushel an acre per year. The trend increase in yield as the result of improving technology was .82 bushel, or 1.78 percent.

The trend with unexplained residuals is plotted in Figure 1. The deviations shown are the differences of yield from the yield that the formula indicated should have resulted from the rainfall pattern that occurred in each of the years. For example, the actual yields were lower in 1947 and higher in 1948 than rainfall by months in each of these years indicated they should have been. Temperature departures from average appear as the most likely cause of the unexplained residuals in these two years. Other factors include timeliness and intensity (affecting run-off). The essential point of this figure is that the unusually high yields of 1956, 1957, and 1958 are explained by favorable rainfall. There is certainly no basis for thinking that the technology has suddenly

⁵This is a first approximation. A more thorough analysis for Illinois and comparable analyses for the principal corn-producing states are in process.

spurred during the past three years. There is no valid statistical basis for concluding that there is other than a straight-line trend. However, if we were to include only the last 20 years, we would be forced to reduce the trend value. It appears that we have more likely erred on the high side than on the low.

After examination of the relation of Illinois and national average corn yields, the Illinois experience was transferred to national normal corn yields on the basis of their 1948-57 relationship. Actual and computed normal yields for Illinois and the United States are shown in Table 2.

The remarkably large deviation of actual production from the production that would have existed with average rainfall by months is shown in Table 3. Production of oats, barley, and grain sorghums was affected

TABLE 2. ACTUAL AND COMPUTED-NORMAL CORN YIELDS,
ILLINOIS AND UNITED STATES, 1926-61

Year	Illinois		United States	
	Actual	Normal	Actual	Normal
	<i>(Bushels per acre)</i>		<i>(Bushels per acre)</i>	
1926	36.0	33.3	25.6	23.7
1927	32.0	34.1	26.6	24.3
1928	38.0	34.9	26.6	24.8
1929	35.5	35.8	25.7	25.5
1930	26.5	36.6	20.5	26.1
1931	37.0	37.4	24.1	26.6
1932	43.0	38.2	26.5	27.2
1933	27.0	39.1	22.6	27.8
1934	21.5	39.9	15.7	28.4
1935	38.5	40.7	24.0	29.0
1936	23.5	41.5	16.2	29.5
1937	48.0	42.4	28.1	30.2
1938	44.0	43.2	27.7	30.8
1939	51.0	44.0	29.2	31.3
1940	43.0	44.8	28.4	31.9
1941	53.0	45.7	31.1	32.5
1942	54.0	46.5	35.1	33.1
1943	50.0	47.3	32.3	33.7
1944	45.4	48.1	32.8	34.2
1945	46.5	49.0	32.7	34.9
1946	56.0	49.8	36.7	35.5
1947	39.5	50.6	28.4	36.0
1948	61.0	51.4	42.5	36.6
1949	54.0	52.3	37.8	37.2
1950	51.0	53.1	37.6	37.8
1951	55.0	53.9	36.2	38.4
1952	58.0	54.7	40.7	38.9
1953	54.0	55.5	39.9	39.5
1954	50.5	56.4	38.8	40.2
1955	56.0	57.2	40.6	40.7
1956	68.0	58.0	45.7	41.3
1957	64.0	58.8	47.1	41.9
1958	69.0	59.7	51.7	42.5
1959		60.5		43.1
1960		61.3		43.6
1961		62.1		44.2

TABLE 3. UNITED STATES PRODUCTION OF FEED GRAINS, WITH PROJECTIONS

Year	Feed grain	Acreage	Normal yield	Production	Production	
					Normal	Actual
		(1,000 acres)	(Bushels)	(Million bushels)	(Million tons)	
1956	Corn	75,634	41.3	3,124	87.5	96.7
	Oats	33,706	31.3	1,055	16.9	18.6
	Barley	12,940	25.6	331	7.9	9.1
	Grain sorghum	9,342	24.0	224	6.3	5.8
					118.6	130.2
1957	Corn	72,616	41.9	3,043	85.2	95.8
	Oats	34,647	31.3	1,084	17.3	20.8
	Barley	14,988	25.6	382	9.2	10.5
	Grain sorghum	19,503	25.1	490	13.7	15.8
					125.4	142.9
1958	Corn	73,470	42.5	3,122	87.5	106.4
	Oats	31,826	31.3	996	15.9	22.8
	Barley	14,876	25.6	381	9.1	11.3
	Grain sorghum	16,761	26.2	439	12.3	17.2
					124.8	157.7
1959	Corn	84,387	43.1	3,637	101.9	—
	Oats	28,823	31.3	902	14.4	—
	Barley	15,089	25.6	386	9.3	—
	Grain sorghum	16,761	26.2	439	12.3	—
					137.9	—
1960	Corn	85,000	43.6	3,706	103.8	—
	Oats	28,500	31.3	892	14.3	—
	Barley	15,100	25.6	387	9.3	—
	Grain sorghum	15,500	28.4	440	12.3	—
					139.9	—
1961	Corn	85,000	44.2	3,757	105.2	—
	Oats	28,200	31.3	883	14.1	—
	Barley	15,300	25.6	392	9.4	—
	Grain sorghum	16,500	29.5	487	13.6	—
					142.3	—

in the same way as corn by departures of rainfall from the average. In this connection it seems worth while to point out that the largest feed-grain production prior to 1957 was 135.4 million tons in 1948. The ten-year average prior to 1956 was 120 million tons.

Review of this period points up the ridiculousness of supporting prices at a predetermined level regardless of yield. Presumably the purpose of price supports is to support income. Thus if, for example, a price support of \$1.14 had been judged in advance as meeting income objectives for corn for the 1958 crop, it follows that a gross value of \$48.45 (\$1.14

times normal yield of 42.5) per acre, national average, would have met income objectives. A price support of 94 cents would have sufficed to meet these objectives if the actual yield of 51.7 bushels in 1958 had been taken into account. To further point up the principle, suppose that the 1959 yield is 33.9 bushels, as much below normal as 1958 was above. In this instance the per acre support would be \$38.65. Thus the 1958 crop would have been supported at \$58.95 and the 1959 crop at \$38.65 instead of the objectives of \$48.45 for 1958 and \$49.13 for 1959 (normal yield of 43.1 bushels an acre for 1959 multiplied by the national support level of \$1.14 a bushel).

From the foregoing it follows that, had the support prices of feed-grains been adjusted in proportion to the deviations of yields from normal, the feed-grain inventory accumulation of the 1956-58 period would not have occurred.

The 1959-61 era. The 1959 acreages indicate an all-out feed-grain production effort. Until such a time as land is taken out of wheat, the land availability for feed grains is approximately exhausted.⁶ Acreage, normal yields, and production of feed grains have been projected and are shown in Table 3.

The recent history of price supports and production controls clearly indicates that we should anticipate acreages of the general order indicated. Thus, two questions become pertinent: (1) At what price can the projected production be moved into use? (2) Is the current support price for corn low enough to get the production used up?

The first guide to the possibility of using the projected production is the disappearance in recent years. Disappearance in 1957-58 was 132.7 million tons. Disappearance in 1958-59 can be rather accurately forecast at this time at 150 million tons. The current disappearance rate is large enough to more than use up the potential production. But disappearance per animal unit is abnormally high. At more usual levels, assuming that the measurement of animal units is correct, a total disappearance of about 143 million tons is indicated. This disappearance also is larger than can be maintained out of current production. With corn at \$1.14 and a 12 to 1 hog-corn ratio, the indicated price of hogs is \$13.68. It is doubtful that current levels of production will force annual average prices of hogs that low. Accordingly, current use of feed grains can be maintained. On this basis a support price of \$1.14 appears to be at or below the long-run equilibrium.

A second guide to using the entire production, while allowing hogs to remain as high as \$13.68, is the potential per capita meat production. How much meat will this price for hogs tolerate, and how much feed will be

⁶ Relatively little productive land or land productivity is tied up in the conservation reserve.

required? We can tie our projections to 1956 as a year of comparatively low hog prices and record high per capita meat consumption. The 1956 per capita meat consumption was 166.7 pounds. If we take into account increased poultry meat consumption, a total per capita red meat consumption of about 161.6 pounds is indicated for 1960-62 as the equivalent of the 1956 rate.

From a per capita red meat consumption of 161.6 pounds, we computed the total meat requirements of an expanding population and then established the number of units of animal production that would be required to produce this amount of meat at historical relationships of animal numbers and meat production, while holding per capita consumption of other livestock products constant. Following this computation of the number of required livestock units, we computed total required supplies of feed concentrates, again using historical relationships. We then adjusted the resultant total for nonfeed grain concentrates fed and for feed grains consumed other than by livestock.

The conclusion from this rather long and confused computation was the following normal feed-grain requirements for the next three years:

1959-60	143.9 million tons
1960-61	146.0 million tons
1961-62	148.5 million tons

One must necessarily have some reservations about this calculation. The constants that we used are not stable. The result can only be expected to average out over several years.

There is nevertheless a substantial amount of conservatism in the figures: (1) The price of hogs in 1956 was above the equilibrium \$13.68 indicated by the \$1.14 corn price. (2) The method assumes that consumers will spend the same amount of money for meat in the years ahead as they spent in 1956, in spite of rising consumer incomes. In 1958 retail meat expenditures were \$90.10 per capita compared with \$78.10 in 1956. We can safely expect consumers to continue to spend in the neighborhood of \$90.00 as meat supplies go up in the years immediately ahead. (3) The method assumes that production of feeds other than feed grains will expand as rapidly as feed-grain use so that the feed-grain requirement will remain a constant proportion. Much more likely, the feed concentrate requirement per animal will go up rapidly as livestock units increase. Increasing livestock numbers must be fed out of concentrates because of the relative fixity of forage production. Feed-grain disappearance rates in 1957-58 and 1958-59 increased substantially with increasing livestock numbers. (4) With increasing consumer preference for beef, we should anticipate a relative increase in beef production and consumption. Beef cattle are relatively inefficient converters of feed. (5) Perhaps the major area of conservatism, and the source of considerable argument, if not downright

error, results from the fact that the studies on demand elasticity in respect to both price and income do not reflect the changes taking place through time. The result is that consumption response and market potential are often underestimated. In the United States, consumption of red meats increased by 36 pounds per capita from 1935-39 to 1956-57 and by 14 pounds from 1947-49 to 1956-57. Data from demand studies in 1939 would have grossly overestimated reductions in consumer expenditure for meat associated with such an increase in production. Data on elasticity of demand tell us little about the economic factors that cause changes in the basic structure of consumption over time. Our assumption is that diets will continue to be upgraded with emphasis on meat. If this is correct then the above estimates are indeed conservative.

From all of this discussion we conclude that, if the amount of rainfall is normal either the price of corn will exceed the current support level or current inventories of feed grains will be reduced in the years ahead. The possible rate of liquidation appears to be at least as great as the build-up.

Since mid-1952 the wheat inventory has increased about 650 million bushels, or 20 million tons, an average rate of 3.7 million tons a year. The feed-grain market appears large enough to take the wheat excess, either as wheat for feed or as feed grains grown on wheat lands.

Parity for What?

The criticisms made by agricultural economists of the parity concept from the standpoint of policy are too numerous and lengthy to discuss in this paper. Parity prices have been criticized as being tied to an outmoded base period which makes them essentially backward looking. Some have suggested that supports should be based on income rather than on price. Others have suggested that the whole parity concept should be discarded in favor of programs based on forward prices, compensatory payments, or welfare standards. Perhaps a general consensus would seem to be that parity, either as a basis for price support or as a farm welfare standard, is outmoded and does not provide a meaningful standard for price programs. The problem is to design some standard that will be simple, fair, and useful in administering national programs.

On the basis of yield multiplied by price, income from feed grains and from most livestock is above parity. Corn, for example, with average yields more than double the average of 30 years ago, is probably at more than 100 percent of parity income per acre, measured in gross income. Some sort of income standard on the basis of national averages would seem to be a logical goal of policy. It could be expressed in terms of support prices, these prices being calculated by taking into account both yield and price.

In a discussion of the parity question, economic efficiency as well as

income is an important objective. The general effect of allotments and quotas seems to have been to increase costs of production rather than to curtail aggregate output. Such evidence is clearly seen in the center of the corn belt, where the 15-acre wheat patch is a common anachronism. Fragmentation of tobacco acreages is another. On the other hand, much has been done in the past six years to move the feed-livestock economy toward a competitive market level. This is a substantial gain not only in efficiency of production but, more importantly, in size of the market for agricultural products. As long as the most difficult adjustment problem is the migration of people out of agriculture, expansion of market size contributes importantly to solution of the farm problem. Agriculture gains as the market for farm products expands. The objective is to have the agricultural industry remain as large as it can and still receive income comparable with that of other segments of the economy. In the final analysis, the ultimate amount of resources—human resources in particular—required in agriculture will be determined by market size.

This discussion does not cover the question of an equitable income for farmers. The problem for economists in this area is intensified by lack of consensus on the income goals of agriculture. To some extent this is a problem beyond economics. Yet income goals as well as efficiency goals must be considered by economists in forming suggested programs. Another matter omitted is the question of the foreign market. Export programs were accepted without change. We have assumed that equilibrium prices will work toward expansion of exports. We have tried to identify the price problem in terms of equilibrium prices for an important segment of agriculture. From this point the next logical question is: What farm income situation will result from the equilibrium prices that our analysis suggests? After that, we can then consider ways and means, other than price supports, of achieving income goals.

DISCUSSION: REVISIONS OF THE PARITY INDEX

JOHN A. SCHNITTKER
Kansas State University

Congress will keep its eye on farm prices and incomes for a long time, I suspect, since it continues to believe that for certain commodities in the short-run farm prices are fairly synonymous with farm incomes. I believe that so long as Congress insists on supporting incomes through supporting prices, indexes of some kind will be useful as standards against which to set the price goal, and to avoid the impression of arbitrary price fixing by

Congress. I wish that Halcrow and Hieronymus had not only asked, but had also answered the question, "Are indexes necessary for support programs?" Instead they used this section of the paper for bluntly changing the subject to the equilibrium price for corn.

The computation of any index, or the gathering of any data which are to influence support prices, is inherently controversial, whether it be parity or the three-year average market price. The average price received by farmers for corn from 1956 to 1958 is not exactly unambiguous. It might, in fact, become as complicated as the parity formula if the price of corn is to depend on it.

The controversy over the latest parity revision was and is a serious matter. But it is not wholly regrettable, being an aspect of the task of educating Congress, a job which never ends and which sometimes seems not to get very far. The controversy might have been avoided by additional consultation with Congress, but at the possible price of compromising good statistical practice, and of foregoing a badly needed revision.

If you have read the 1959 hearings of the House Subcommittee on Agricultural Appropriations, you will be convinced that Mr. Stauber and Mr. Wells did a good job on the revision, and were restrained but frank in their testimony.

I can add little to Stauber's call for systematic upgrading of the price indexes, and for better integration of all our related time series. We have in our Association a committee on agricultural data which we ought to hear more about, but I doubt that we shall, for data-gathering problems are dull for most of us; we like ours pre-packaged.

Estimating the Equilibrium Price of Corn

I believe Halcrow and Hieronymus will turn out to be very wrong in the matter of the equilibrium price of corn in 1959-61. I do not agree that in the absence of price supports the 1952-56 average price of hogs would have been only five to six per cent or \$1.00 per hundredweight lower than it was. Even if grain production had been no greater without price supports, the feed supply with no farm program would have been increased by roughly five million tons of coarse grains added to stocks each year, by five to eight million tons of grain exported under special programs each year, and by most of the 20 million tons of wheat added to stocks from 1952 to 1956. The annual addition to the feed supply would have been 10-15 per cent of the amount fed yearly. I expect meat animal prices would have been cut by more than five to six per cent as postulated today.

I do not agree that feed grain yields and production from 1956 to 1958 were dominated by excessively good weather. This was a factor, but we should recall also the Great Plains drought of 1953-57, and the Acreage

Reserve of 1956 to 1958, both large offsetting factors to good rains in the Cornbelt. I recall, when looking at the projected normal U. S. corn yield of 44 bushels for 1959 to 1961, that other prophets of lower corn yields have been wrong; and I remember a recent Herblock cartoon in which a high agricultural official cried sadly, "It looks like we'll have a good corn crop, too."

I think it is quite farfetched to dismiss increased inputs and technological change when projecting grain yields, as Halcrow has done, and to project U. S. corn yields from Illinois rainfall.

By this method, the authors produce a happy ending; they begin to feed up the corn stockpile, raise the price of corn above the support level, feed the annual surplus plus some of the stocks of wheat, and maintain livestock prices at about present levels. I do not know when I have seen so much built on so little.

DISCUSSION: REVISIONS OF THE PARITY INDEX

GEOFFREY SHEPHERD
Iowa State University

Mr. Stauber's paper is a competent and painstaking job. My comments pertain chiefly to the three related policy questions he asks at the end of the paper:

1. Should the revision of the indexes be placed on a regular and recurrent basis, such as every five years?

I think they should. The obsolescence of the weight base period is a continuing problem, and the revisions to overcome it should be put on a continuing basis.

2. Should the several indexes compiled by the different branches of the Federal government be placed on a common weight base period?

Here again I think they should, although this answer involves some qualifications which are explored under the next question.

3. Should the different indexes all be based on the same base period?

The answer to this question involves a whole raft of problems. We can deal with them by asking first, what the objective of the use of the parity index and the parity ratio is; for an index should be designed and its base period chosen in line with its objective.

Parity prices were designed to serve as measuring sticks for Congress to use in its declared policy, in the Agricultural Adjustment Act of 1933, to "reestablish prices to farmers at a level that would give agricultural com-

commodities a purchasing power with respect to articles that farmers buy, equivalent to the purchasing power of agricultural commodities in the base period" August 1909 to July 1914 for all farm products except tobacco, for which it was to be August 1919 to July 1929. The "modernized parity" modification adopted in 1950 annually realigns the parity prices for the different farm products in line with their most recent 10-year average levels, but maintains the level for farm products as a whole on the 1910-14 base.

Parity Prices and the Economic Status of Farmers

Congress evidently assumed that this reestablishment of prices would reestablish the economic status of farmers on a par with their status in the base period.

In pursuit of this objective, the parity ratio is used to measure the economic status of farmers, and percentages of parity are used as the bases for CCC loan operations running into billions of dollars. Are the parity ratio and parity prices adequate for these purposes?

Surely it is clearly evident that they are not.

Take the parity ratio. How can it measure the economic status of *farmers* at all accurately, when it deals only with prices *per unit of product*, and leaves out of account the other half of the picture—the great changes in the quantities of inputs and outputs that result from large and rapid technological change?¹ Economic status is measured by net income—by prices received \times quantities sold, minus prices paid \times quantities purchased—per farmer. It cannot be accurately measured by prices received and paid alone.

The same thing is true of parity prices for individual farm products.

The problem with parity prices is compounded by the fact that they are used as bases for loan rates and storage operations. How can they serve for this purpose: (1) when they measure changes, not in factor costs which determine supply, but only in factor prices, and (2) when they only partly and with a 5-year lag reflect changes in demand for individual farm products, and do not do this at all for farm products as a group?

It seems to me that it does not make sense to use the existing parity price ratios and indexes at all for the purposes to which they are put.

What do I suggest could be used instead?

These are my suggestions:

1. That the present parity price formula be converted into a cost and returns formula that will reflect the economic status of *farmers* more ac-

¹ Changes in quantities of course are taken into account in the weighting of the prices, but not in the "cost" sense that I use here. That is, if all the quantities used as weights doubled, that would not affect the weights used in the present parity index, but the cost would be doubled.

curately, relative to non-farm groups, than the existing parity price ratio can.

Several of us at Ames have opened up this subject and computed some parity returns indexes in an inter-regional bulletin that is now in the editor's hands. To answer Mr. Stauber's third question: these indexes could well have the same bases as other governmental indexes.

2. That existing parity prices be replaced by prices based on a parity returns formula. Parity returns prices of this nature are also given in our bulletin.

3. That neither the existing parity prices nor the new parity returns prices be used as the basis for loan rates and CCC storage operations. There are two reasons for this: First, the parity returns prices reflect only changes in supply, not in demand. And, second, storage operations can smooth out variations in prices about their long-run levels, but cannot raise those long-run levels too. A suitable price support level for smoothing out variations would be the moving average of market prices over the past few years, adjusted for abnormally large or small crops and for prospective changes in demand. If these prices would result in farm incomes that would return less than comparable (i.e., parity) returns with returns in other occupations, then that problem, which cannot be solved by storage operations, can be attacked by other means, which have been spelled out elsewhere.

Estimating the Equilibrium Price of Corn

With respect to Halcrow's and Hieronymus' paper: Their conclusion that the support price on corn has been reduced below equilibrium levels appears to me to be incorrect.

Walter Wilcox recently calculated what would have happened year by year if all the feed grains that went into stocks after 1952 had instead been fed to hogs. He assumed that one ton of feed grains would produce two hogs, and used an elasticity of demand for hogs of -0.4 . His estimates of the depressing effect on hog prices ran up to as much as 49 per cent for 1957-58. The estimated hog prices averaged \$12.20 for the period 1952-56. If a 13 to 1 hog-corn ratio had existed, the estimated 1952-56 average price of corn would be about 95 cents per bushel.

Halcrow and Hieronymus fed all the stocks to hogs, as Wilcox did. But they used only the stocks of corn, and added the estimated 1952-56 increase in pork production (11.5 per cent) to total meat production, thus arriving at an increase in total meat production of only 4.5 per cent. Then the lowest long-run elasticity of demand for meat at retail that they used (-0.8) gave them only modest reductions in average hog prices for the period, from \$18.46 for barrows and gilts at Chicago to \$16.61. Then using

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a hog-corn ratio of 12 (which is low) they arrived at average corn prices at Chicago for the period of \$1.38.

Wilcox used his table only for clarity of exposition. He would point out that actually the feed would not all have been fed to hogs; some of it would have been fed to other livestock, which have higher elasticities of demand than the -0.4 short-run figure he used for hogs. His conclusions, therefore, may over-state the actual depressing effect on hog and corn prices.

In contrast, it seems to me, Halcrow and Hieronymus clearly understate the depressing effect.

First, it seems invalid to add the increase in pork production to beef and other meats, and use the elasticity of demand for all meat to estimate the effects of the increase in pork production on pork and hog prices. The elasticity for meat applies to meat as it was made up in the past, not to meat with an unusually high proportion of pork, the demand for which is less elastic than the demand for beef. Their elasticity is based on pre-war data. Daly estimates the post-war short-run elasticity for all livestock and livestock products at -0.2 . The long-run elasticity would not likely be more than twice as high as this.

Second, dealing only with corn and hogs, they ignore the fact that other feed grains accumulated in storage too during 1952-56, and that under a free market, these accumulations would have been fed too along with the corn. They would either have been fed to hogs, adding to the increase in pork production, and depressing hog prices further, or more likely would have been fed to other livestock, increasing their production too. If the latter happened, that would have depressed those livestock prices, and this would have shifted the demand curve for pork to the left, resulting in the same effect as decreasing the elasticity of the demand for pork back towards its short-run figure. The elasticity in any case is lower when meat supplies are high than when they are low. I would be more inclined to use the original figure of -0.4 than their figure of -0.8 . Several of us at Ames working on this question have arrived at tentative "equilibrium" price estimates for 1952-56 of about \$15 for hogs and \$1.15 for corn. The \$1.15 for corn would have been well below the loan rates then. Throwing the large feed supplies of 1957 and 1958 on the market would have depressed prices still further, below the loan rates for those years.

Third, Halcrow and Hieronymus use a rather modest figure of about 0.56 of a bushel a year for the trend increase in corn yields resulting from technology. Marion Clawson uses about 0.82. We use about 0.90. We also estimate slightly higher yields for some of the other feed grains. This leads us to estimate that with average weather, feed grains production in 1960 and 1961 will run over 150 million tons a year, rather than the 140 to 142

million tons that they estimate. Accordingly, our estimates of corn prices in the future are lower than theirs. We estimate that unless larger amounts of land are taken out of production in the future than in the past, the present loan rate for corn is considerably higher than the equilibrium price level, not lower. Kutish, Kaldor and I estimate that equilibrium price level at less than \$1.00 per bushel.

Finally, I would like to point out that corn production in the future may exceed all our estimates, for a reason that none of us have mentioned nor included in our estimates, and which is difficult to estimate with precision now. On fertile level land, the traditional rotation of corn, corn, oats and clover can be replaced by more nearly continuous corn plus fertilizer without any serious reduction in yields. If this replacement takes place on a considerable scale, corn acreage may rise considerably above the 85 million acres that Halcrow and Hieronymus and I all used in our estimates from 1959 to 1961, and corn production may exceed all of our estimates given above. Corn prices then would be correspondingly lower.

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MARKET ORGANIZATION AND ECONOMIC DEVELOPMENT

Chairman: A. J. Brown, University of Kentucky

MARKET ORGANIZATION AND ECONOMIC DEVELOPMENT¹

GEORGE L. MEHREN

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AMONG nations, there are different stages of commercial development. Within any nation, there are similar differences among economic sectors. There are many alternative classifications of stages of marketing developments.² In presubsistence economies, there can be little marketing. However, in nearly all countries, agricultural industries are the least and the last developed.

In many places, processed products can be ordered in standard lots, to recognized specifications without inspection, through clear market channels with modern facilities, and with going markets offering comprehensive coverage for each commodity class. In the same places, unprocessed agricultural commodities are often produced on small fragmented farms—unstandardized with respect to breed, seed, and root stocks—by ancient methods on noncommercial and nonmarket oriented enterprises, yielding grossly heterogeneous output.³ There is nearly always a monopoloid market structure in all functional segments of the food trades.⁴

Agricultural processing and distribution are low in physical efficiency.

¹Giannini Foundation Paper No. 185.

²William Copulsky, "Forecasting Sales in Underdeveloped Countries," *J. Marketing*, 24:1, July 1959, pp. 36-40. Copulsky described—from the viewpoint of marketing—the following stages: preindustrial; primary manufacturing and exports; nondurable consumer finished goods; capital goods; consumer-durables and related intermediate products; and exports of manufactured goods.

³George L. Mehren, *El Mercadeo de los Productos Agrícolas en Venezuela*, Caracas: Consejo de Bienestar Rural, September 1954.

⁴Harper W. Boyd, Jr., Richard M. Clewett, and Ralph L. Westfall, "The Marketing Structure of Venezuela," *J. Marketing*, 22:4, April 1958, pp. 391-397. While there is, for example, a substantial urban consuming market in Venezuela, still about half the people live primitively in shacks or huts. Some 42 percent of the people are farmers with little education. More than one-third rarely if ever participate in a commercial market. There is only a small middle class or bourgeoisie. Typically, wives or maids buy from peddlers or from the small retail shops with high markups, low volume, and no price competition. Guild associations set and maintain prices. There is much credit. Wholesaling is generally dominated by import agents performing several functions. There is virtually no organized wholesaling in perishable foods.

Handling methods constitute an outright and serious health menace.⁵ Scale and method of operation have advanced little beyond medieval levels. Known technologies are not used. There is no real standardization. Margins are typically high and rigid. Market structures do not induce coordinated adjustments among the several functional segments in response to changes in volume, cost, consumer preferences, purchasing power, or supplies of related products in any one of them. Gross price differentials are general within each segment. There are few organized market centers, facilities, or channels. Often, there is no known or going price. Market exploitation of subdemands is difficult or impossible. There is drastic underemployment or low productivity in distribution. Few alternatives of procurement to distributors or sale to producers or processors are open. Tacitly or otherwise, guild-like associations set margins and operating terms, often with active government participation.⁶ All of the agricultural industries are marked by high costs, low income, and poor allocation.

Paradoxically, other industries are almost exactly like their counterparts in the United States. There is a trading class aware of the existence and differing income effects of alternative economic decisions, profit motivated, free of traditional constraints, and willing to take risks. Here, the old open market has been replaced by coordinated interfunctional communications through means other than sole dependence on openly-determined prices. Firms develop full American merchandising policies. Guilds or associations often limit competition, but markets are far closer to the competitive structure than in the domestic food industries.

Pressure for economic development, with agricultural industries as the focus for program, is urgent and sometimes violent. The pressure does not merely reflect the relative disparity or instability of agricultural incomes. There seems also to be general recognition that market organization in agricultural industries is a major determinant of economic change.⁷

Patterns of Change

"Narrow" markets, small-scale production, archaic processing and distribution, multiproduct family firms, and hand-to-mouth consumption are frequently associated with economic, social, and political instability, engendering imperfect competition, primitive and tradition-bound opera-

⁵ Mehren, "Obiettivi, Metodi e Limiti della Politica di Prezzo Nello Sviluppo Agricolo, *Rivista Internazionale di Scienze Economiche e Commerciali*, 3:6, 1956, 501-520.

⁶ W. Arthur Lewis, *The Theory of Economic Growth*, London: George Allen & Unwin, Ltd., 1955, pp. 131-132.

⁷ Peter F. Drucker, "Marketing and Economic Development," *J. Marketing*, 22:3, January 1958, pp. 252-259.

tions, and a compelling aura of suspicion.⁸ Demand is narrowly localized. Retailing structure is usually least competitive. Often there is bias against the landowner, merchant, money lender, and the tradition-keepers who may impede change.⁹ Yet, nearly everywhere, there appears to be a slow change away from traditional production and open markets. There are always different functional levels and some collateral functions wherever there is any marketing. Traditional farm and firm operations linking the different segments together by open prices alone are the targets and the centers of change.

The Questions at Issue

For each of the questions that emerges, a sort of hypothesis can be adduced, largely from guessing, with little testing but constituting the only bases for policy formulation. Economic development here means an increase in output, a change in its components, and different income and wealth distribution.¹⁰ Market structure is defined by the usual price, substitution, and entry elasticities, and appraisals of conduct and performance.

Major questions can be posited as follows:

1. Why are there different rates of development in different sectors of an economy?
2. Must development be "balanced" between sectors and among the different functional levels within a sector?
3. Why, in all economies, are the food and agricultural industries the least and the last developed, not using known technologies, organizations, policies, and procedures?
4. What are the functional relationships between change in the food and agricultural industries and economic development?
5. How is market structure related to economic development generally? Again, there is no theory linking these patterns of change.
6. Why are there so many monopolistic elements in all food and agricultural economies?¹¹

⁸ Peter T. Bauer and Basil S. Yamey, *The Economics of Underdeveloped Countries*, Chicago: U. of Chicago Press, 1957, pp. 36, 114. S. A. Husain, *Agricultural Marketing in Northern India*, London: George Allen & Unwin, Ltd., 1937, p. 97.

⁹ Alfred Bonne, *The Economic Development of the Middle East*, New York: Oxford U. Press, 1945, p. 52. Albert O. Hirschman, "Effects of Industrialization on the Markets of Industrial Countries," *Progress of Underdeveloped Areas*, Berthold Frank Hoselitz, ed. Chicago: U. of Chicago Press, 1952, p. 270. Bonne, *Studies in Economic Development*, London: Routledge & Kegan Paul, 1957, pp. 43-63. R. Nurkse, *Problems of Capital Formation in Underdeveloped Countries*, New York: Oxford U. Press, 1953, pp. 8-10, 57.

¹⁰ Mehren, "Market Structure and Procedures in Economic Development," reprinted from *Malayan Econ. Rev.*, 4:1, April 1959, p. 96.

¹¹ L. J. Zimmerman, *The Propensity to Monopolize*, Amsterdam: North Holland

7. What administrative mechanisms are needed to change market structure in order to achieve the desired development of targets?

The Hypotheses

No theoretical constructs are available to identify relevant factors, their net interrelations, or the general system of variation in development.¹² The crude hypotheses offered here therefore depend largely on intuition and in any formal sense are untested, perhaps untestable. These hypotheses and the implicit policy conclusions are disjunctive.

1. Different levels of development in different sectors are often explained by different political and social backgrounds among regions, the typical economic attributes of peasant agriculture, ready-made markets for nonagricultural products, and concentration of purchasing power in urban areas.¹³ "Degree of industrialization and political emancipation," along with easier credit for nonagricultural industries, are often said to determine the level of the "peasantry."¹⁴ Constraint of decision making by tradition may well be a major determinant of the whole food-agriculture system.

2. "Balanced" growth exponents hold that a stagnant agriculture means distress in manufacturing; that parallel development in different sectors is both market-creating and investment-inducing; that maintenance of "balanced" development in agriculture is particularly important with re-

Publishing Co., 1952, pp. 26-41. See also, Bauer, *West African Trade*, Cambridge: U. Press, 1954. Bauer discusses in detail the causes for the relatively minor resistance to monopoly structure; major reasons inducing the development of monopolistic structure; the impact of governmental and traditional conditions rendering the development of monopoly relatively easy; and those determinants in relatively underdeveloped economies of the capacity to maintain monopoly (pp. 35, 43, 95, 104, 108, 148, 190, 389-390).

¹² See Howard S. Ellis, "Conditions and Rates of Economic Growth," *J. Farm Econ.*, 37:5, December 1955, pp. 807-820. On page 818, "Four moving causes: innovation; cultural factors of which the chief seems to be political; the autonomous factor of 'balanced growth'; and the increase of population in countries not already overpopulated . . . another prime mover . . . newly won political independence of a region from outside rule or the liberation . . . from domination by a minority." See, also, Willard F. Mueller, "Some Market Structure Considerations in Economic Development," *J. Farm Econ.*, 41:2, May 1959, pp. 414-425.

¹³ United Nations Economic Commission for Europe, *Economic Survey of Europe*, 1953, Geneva: 1954, pp. 124, 132-133. Ravi S. Sharma, *The Economy of Nepal*, Berkeley: Human Relations Area File, South Asia Project, University of California, 1956, pp. 7-8, 19-22. Pan American Union, Division of Agricultural Cooperation, *Agriculture in Venezuela*, Washington: 1947, pp. 5-11. See, also, Ugo Ruffolo, *The Outlook for Italian Agriculture*, Rome: International Institute of Agriculture, 1946, pp. 15, 55. Mehren, *Agricultural Marketing in Venezuela*, Caracas: Council of Rural Welfare, 1953, p. 206.

¹⁴ Doreen Warriner, *Economics of Peasant Farming*, London: Oxford U. Press, 1939, p. 24.

spect to foreign trade balances; and that, if labor be transferred from agriculture to sectors with no higher productivity, it should be so used for the saving of foreign exchange.¹⁵ "Unbalanced" growth exponents hold that, with many loosely lagged complementarities among industries, parallel growth is unnecessary and even undesirable.¹⁶

"Balanced" development does seem to prevail among different functional levels within any food and agricultural economy. If so, efforts drastically to change economic organization in any one functional level should be associated with concomitant and coordinated changes at others. Further, change in any major segment would lead to coordinated changes in other parts. There seems to be continuing and pressing necessity for "balanced" development within these sectors. Firms in various functional segments, even if separated by open markets, are linked through technical and demand interrelationships in any kind of economy.

3. With typical agricultural production, the typical processing and marketing segments are quite inevitable and perhaps are highly "efficient." Often, land tenure is uncertain, not exclusive, or inconsistent with long-run build up. Enterprises are small, fragmented, and multiproduct to spread risks, to fit into market channels, and to use otherwise underemployed labor. Given the distributive trades, any other type of domestic production would be virtually impossible. Basic stock is often unrelated to demand or technical requirements of handlers. There are few organized raw material markets. Processing—such as it is—is often a public monopoly for revenue. There is neither inducement nor capacity to use modern financing, storage, communication, or transportation facilities. Distributive enterprises are typically small and monopoloid.

The dilemma is clear: The whole system must be changed, but a start can be made in only a few spots. Modern distribution systems do not graft to primitive production units, and vice versa. However, preference biases seem to disappear when purchasing power rises. Commercial processing units in some primitive food economies have quickly induced and required coordinated changes in suppliers' and customers' enterprises. Governments could eliminate a few of the worst monopolistic restrictions, not by legislation and despite the special political position of small farms and small shops. Policy suggestions, however, are meaningless unless they affect the operations of individual enterprises. Commercial distributive

¹⁵ Lewis, *op. cit.*, pp. 141, 227, 277-283, 340, 354. Lewis also holds that "The maintenance of equilibrium in world trade depends upon a balanced growth of manufacturers, of raw materials and of food in the world as a whole." John Jewkes is also an exponent of this viewpoint. See "The Growth of World Industry," *Oxford Economic Papers*, New Series, 3:1, February 1951, p. 14.

¹⁶ Hirschman presents this viewpoint in *The Strategy of Economic Development*, New Haven: Yale U. Press, 1958, pp. 66-73.

classes and some governments seem to be aware that changes must induce enterprises voluntarily to adjust themselves.¹⁷

4. In nearly all countries, a large proportion of labor works in agriculture. A large percentage of income is spent on food. Domestic markets must be built among agricultural people to provide outlets for nonagricultural products, and without raising nonfarm wage costs. The food and agricultural industries are extremely important in trade balances. They are major foci of the accumulation and allocation of capital goods. Perhaps most important, political stability and labor productivity frequently depend upon food supplies.¹⁸ The food and agricultural industries are quite clearly the primary centers for economic development.

5. Monopoloid structure of processing and distribution appears generally to have precluded effective resource allocation and use of available techniques.¹⁹ Nearly all analyses concur in this point. Emergence of competitive attributes seems to bring new value relations, systems of preference, patterns of resource use, production methods and scale, and more highly commercialized enterprises.²⁰ It seems necessary both to induce and to enforce competitive conditions in most processing and distributive trades.²¹ Commercial channels for processing and distribution of cash crops appear to be essential to capital formation in agriculture. Distribution often absorbs much resources—otherwise little utilized—and is highly labor-intensive. Traders appear to be a major influence in developing exchange economies. Nonetheless, mere statutory or administrative mandates for competitive conditions have been utter failures. One conclusion seems evident: Indefinite maintenance of small-scale distributive monopoly means indefinite maintenance in one form or another of peasant production.²²

6. Monopoloid processing and distribution are obviously and strongly

¹⁷ Bauer and Yamey, "Economics of Marketing Reform," *J. Pol. Econ.*, 62:3, June 1954, p. 235.

¹⁸ Gunnar Myrdal, *Rich Lands and Poor; the Road to World Prosperity*, New York: Harper & Brothers, 1957, pp. 27-31, 34. W. Brand, *The Struggle for a Higher Standard of Living*, Glencoe, Ill.: The Free Press, 1958, p. 332. National Bureau of Economic Research, *Capital Formation and Economic Growth*, Princeton: Princeton U. Press, 1955, pp. 410-424. Bruce F. Johnston, "Agricultural Productivity and Economic Development in Japan," *J. Pol. Econ.*, 59:6, Dec. 1951, p. 510. W. W. Rostow, "The Takeoff Into Self-Sustained Growth," *Economic Journal*, 66:261, March 1956, pp. 25-48.

¹⁹ Giuseppe Orlando, "Agricultural Marketing and the Italian Economy," *J. Marketing*, 21:3, Jan. 1957, pp. 327-328.

²⁰ Norman S. Buchanan and Howard S. Ellis, *Approaches to Economic Development*, New York: Twentieth Century Fund, 1955, pp. 23, 127, 146, 149, 406, 409, 428.

²¹ S. D. Neumark, "Some Economic Development Problems of African Agriculture," *J. Farm Econ.*, 41:1, Feb. 1959, pp. 46-50.

²² Bauer, *Economic Analysis and Policy in Underdeveloped Countries*, Durham, N.C.: Duke U. Press, 1957, pp. 60-118.

viable virtually throughout the earth.²³ General institutional frames seem to be congenial for emergence and maintenance of monopoloid structures.²⁴ Possibly, the monopoloid structure is inevitable and even desirable given the consumers and producing units with which handlers must deal. Change must be cordinated and simultaneous in all functional levels.

7. Policy would require operational specification of the targets of general development, with internal consistency among them and with clear specification of constraints. Specification of the determinants of target variables and their interrelationship would identify the variables through which targets could be achieved. However, naming determining variables and their optimum magnitudes is substantially different from developing an administrative machine through which the desired magnitudes of the target-determining variables could be obtained and maintained. Here, there appears to be no general logic through which effective hypotheses might be developed. Yet this is the really operational phase of shifting market structure in the food and agricultural trades as a means of enhancing economic development.

Tests of Hypotheses

None of these hypotheses have really been tested, nor have they ever been derived systematically from appropriate logical constructs. Observation seems to support their tenability. Land reform and similar changes in production or distribution procedures have usually failed without correlative changes in interrelated functional segments. Major change in any functional segment, if associated with profit inducement to firms in others, seems to generate a pattern of coordinated adjustment. Commercial distribution businesses are emerging in several nations.

Some specific instances—large and small—seem to support the rough hypotheses. There are many places in which modern refrigerators, silos, and warehouses are empty because there are no production units conceivably able to supply them or customers conceivably able to purchase from them. Supermarkets have failed when they have depended upon supplies of perishables from peasant farms. Consolidated farms, often given excellent equipment, have produced precisely as the old peasant farms long did in the absence of effective market channels for distribution of specialized product. No pretense is made here of a test of hypotheses. Nonetheless, experience seems to support them at least as preliminary bases for inquiry.

²³ Simon Kuznets, *et al.*, editors, *Economic Growth: Brazil, India, Japan*, Durham, N.C.: Duke U. Press, 1955. Bauer and Yamey, "Competition and Prices: A Study of Groundnut Buying in Nigeria," *Economica*, 19:73, Feb. 1952, p. 35. Myrdal, *An International Economy*, New York: Harper & Brothers, 1956, pp. 276-277.

²⁴ Bauer, *West African Trade*, Cambridge: The University Press, 1954.

Summary and Suggestions

National economies are at many different stages of economic development. However, enterprises in all segments of the food and agricultural industries have lagged far behind firms in other industrial sectors. Modern commercial enterprises in one functional level unsupported by coordinate adjustment in others have failed. Pressure for economic development is urgent throughout the world. It is especially urgent with respect to the food and agricultural industries. Institutional constraints and technical and demand interrelationships may explain the relatively retarded status of these trades. There must be different market structures in agriculture if the targets of economic development are to be obtained. Finally, in many countries of the world, the first indications of change from the ancient system of traditional production and the open market are showing.

Operational expression of targets of economic development relevant to the food industry engenders several research questions. Despite the absence of a compelling theory of change or growth, crude hypotheses can be formulated to encompass differential rates and levels of economic development among different sectors. There are no universally accepted hypotheses with respect to the necessity for "balanced" change among major sectors. There must be balanced change among the different functional levels within the food and agricultural sector. Reasonable hypotheses may be developed relating market structure in the food and agricultural industries to economic development generally. These hypotheses provide thus far the single major basis of logic for the appraisal of alternative developmental programs. In all nations—including and perhaps especially this one—there are major monopoloid elements clearly inconsistent with effective allocation of already-produced food and agricultural commodities and equally unsuitable with respect to inducing the type of change in the food and agricultural industries which would clearly be consistent with the targets of general economic development programs.

A sort of dilemma appears. It is difficult, if not impossible, quickly to relieve firms of the ancient monopoloid structure unless coordinated changes are made in related levels. Yet, it is frequently impossible simultaneously to introduce balanced changes among firms in all of the segments. Again, experience rather than theory—and both may be dangerous—indicates that the usual effects of the dilemma may be mitigated. In an effective administrative mechanism, the centers of authority are paralleled by centers of inducement. Nearly every nation has statutes nominally designed to achieve virtually every one of the governmental services or controls prevailing here. Nearly always, no effort is made to enforce these statutes, primarily because there is no profit inducement to individual firms to avail themselves of them.

The major question, then, is the means whereby government can adjust its regulatory, facilitating, or interventionist activities so as to provide inducement to desired changes in enterprise organization. Ultimately, this is the only means of shifting market structure. Judiciously applied and consistent authority may also be helpful. There seem to be several ways in which this can be done. In some areas, a modified modern plantation system seems to work. There are nations in which processing plants have been established in areas with proper growing conditions for the outturn of a standardized commodity. Even beginning with a peasant-production basis, it seems possible fairly quickly to induce producers to develop products acceptable to handlers, both in terms of technical production requirements and merchandising program, and do it through a rationalized marketing channel. Shift in purchasing power will shift market structure, but this is not operationally feasible in most nations. The question unresolved can be stated simply: What means can be taken among what kinds of firms and at what functional levels to persuade and require enterprises to assume modern commercial characteristics and effectively to coordinate their activities with the necessities and the wants of enterprises at other functional levels?

Nearly always, people in the lesser-developed countries suggest explicitly the consolidation of land holdings; the reform of the agricultural credit system; the establishment of cooperatives; mandatory introduction of grades and sizes; and standardization of products, methods, and packs.²⁵ There are suggestions for research, education, and extension. Yet, these suggestions appear generally to have had little effect. Exhortations for shifting labor from agriculture; for forced introduction of modern distribution units; for mechanization of farming seem to have been equally pious in intent but equally ineffective in generating change. There are other examples. The fundamental difficulty still unresolved is to find some means in each country, and perhaps differently in each country, to introduce modern commercial activities at some functional level in such a way that enterprises in other functional levels are induced to adjust themselves to the same kind of commercial, profit-motivated activity.

²⁵ See M. Bandini, "The Principal Problems of Italian Agriculture," *Proceedings of the Seventh International Conference of Agricultural Economists*, London, New York, Toronto: Oxford U. Press, 1950, pp. 197-201. Hameed M. Farooqui, *et al.*, *Agricultural Marketing in Pakistan*, Karachi: Amin Book Co., 1958. M. J. B. Ezekiel, ed., *Towards World Prosperity*, New York and London: Harper & Brothers, 1947.

MARKET STRUCTURES AND ECONOMIC DEVELOPMENT IN THE PHILIPPINES

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MY DISCUSSION will expand upon the main paper given by Professor Mehren by presenting some observations on concentration in agricultural market structures in the Philippines, with particular reference to their implications for the stated goals of economic development. Much of what I shall say is taken from my recent article on the subject in this Journal, which contains the basic data, source notes, and more complete arguments.¹

My argument is essentially that concentration and industry development seem to accompany each other and that policies to permit or encourage structures with a high degree of concentration may be the most feasible policies to get rapid development in the food industries.

The economic development program in which we cooperate is oriented around the pressing dollar exchange problem. Thus, developing the agricultural industries became especially strategic due to the fact that 25 percent of total imports were processed food, textiles and cigarettes. In general, these are the chief agricultural items about which the consumer is quality conscious, which makes consumers unwilling to substitute local brands until their quality and prestige are established.

Since independence, the new government has participated heavily in some markets, and adopted direct exchange and pegged currency controls in 1949. However, it has been relatively lax on regulation, service and incentive programs.

The usual structural analysis would call at least for measures of firm numbers and concentration, appraisals of barriers to entry, and product and service differentiation. It would furnish some conclusions as to conduct and performance. I have stabbed at some of these in the paper to which I referred. Because of time limits, the present discussion will be confined chiefly to numbers and concentration.

Concentration

To measure the number of firms and degree of concentration in particular industries, the chief data source was a directory of key establishments (more than five employees), based on a survey made by the Philippine government with assistance from the International Cooperation Administration. From this was compiled the number of firms and concentra-

¹Hugh L. Cook, "Observations on Market Structures and National Economic Development in the Philippines," *J. Farm Econ.*, Aug. 1959, pp. 500-518.

tion ratios measured by employment, for selected industries that process and handle agricultural products. The list includes processing companies, exporters and importers, wholesalers, retailers, and storage. Many of these, however, are not specialized to agricultural products.

Concentration ratios measured by employment tend to understate the measurement by shipments, judging from American industries. There are additional reasons why these ratios tend to understate the concentration that would be found if more adequate data were at hand.

Overall concentration in the food manufacturing industries appears somewhat lower in the Philippines than in the United States. However, when particular industries are compared, concentration ratios are higher in Philippine industries than in roughly comparable American ones. Overall concentration in manufacturing in the Philippines is low because of the relatively large number of manufacturing industries which perform very elementary functions and into which entry is easy, because so little capital and technology are required.

In general, when we look at particular industries, the index of concentration is highest in the most highly developed ones. The largest 20 establishments have 80 percent or more of the employees in nearly all the relatively developed industries where the technology is capital intensive. Less than 10 of these industries are made up of as many as 25 companies.

In food and fiber processing, the industries in which the largest 20 establishments have concentration ratios of 80 or more include; grain mill products, sugar, desicated coconut, poultry and cattle feeds, starch, alcohol, breweries, soft drink, all the textiles, tanneries, vegetable oil and copra cake. The hypothesis that these are the most highly developed tends to fit the writer's observation as to the acceptability and availability of the products.

It is easy to explain the half dozen relatively underdeveloped industries with high concentration ratios. As an example, a subsidiary of Cal Pak, which packs Del Monte pineapple, is a highly integrated operation with 2,500 of the 2,700 employees among key firms in the fruit and vegetable packing industry.

In general, the comparison of what is developed with what is relatively undeveloped is based partly on data on imports, relative prices of imported and domestic products, domestic production data, numbers and sizes of companies compared to market size, and so on. This is heavily supplemented by general information obtained from the ICA Mission and by personal observation on general availability, and local consuming habits. Although these are rough measures, precise ones in an underde-

veloped economy are often as unnecessary as to use calipers to decide whether a redwood tree is large or small.

The industries with low concentration ratios fit into four categories:

(1) Those with labor intensive technology but which are relatively developed, which include ice cream and ices, noodles manufacturers, bakeries, food seasoning, and so on.

(2) Those which are relatively developed and tend to be capital intensive, but are old industries with a large market, including rice and corn milling and most of the wholesaling and export-import industries.

(3) Those in which the advanced technology is capital intensive but in which the investment is not being made properly to develop the industry. The most notable of these is lumbering, though abaca, coconut, and tobacco wholesalers could belong in this group.

(4) Those in which government participation has affected concentration. In this group would go rice and corn milling, and some wholesaling and retailing industries. The Agricultural Credit and Cooperative Finance Administration (ACCFA) has built 200 or more rice mills and warehouses, working through local cooperatives. The National Marketing Corporation (NAMARCO) was established to break the "monopoly of the alien merchant." This government corporation handles imports of foods, plumbing equipment, building fixtures and resells to selected stores. The National Rice and Corn Corporation (NARRIC) was established primarily to import those commodities and resell them at politically set ceiling prices in retail stalls.

Concentration is much greater in food processing industries of the Philippines than in those (matched as closely as possible) for the United States. In nearly half of the Philippine industries the concentration ratios for the largest eight companies fall in the 80-100 bracket. On the other hand, in about one-eighth of the industries the ratios fall in the under-20 bracket. For the United States there are a considerable number of industries in each bracket of ratios. Further indication of the kind of competition that may be expected is that the average number of firms in these industries is quite small compared with the United States; competitive behavior of the large firms is more probable where the number of firms is large, even if concentration ratios are high.

Indications of the relative sizes of the national market in the two countries are that the United States has about nine times as many food processing firms serving seven times as many people who have national income nearly 90 times as great.

In contrast to concentration in food processing, the ratios were found to be no more than half as great in the food retailing industry as for the United States.

Barriers to Entry

It seems to me that restriction on entry should be considered under perhaps five headings. They are: (a) direct government controls, including the exchange rationing of the Central Bank, and the impact of a pegged currency ratio; (b) laws discriminating against alien management and alien capital; (c) uncertainties caused by the behavior of government in the same business; (d) capital and technological requirements, including credit; and (e) lack of market news, grades and standards, inspections; inadequate concentration of farm production, and so on.

I will not try to describe these here except to make the comment that this new government conforms to the generalization by Morton Solomon; it "has no laissez-faire conception of a clearly defined free economic sphere distinct from its own province, nor on the other hand does it have a planned economy conception of its responsibilities."² This results in creation of risk and uncertainty for businessmen through the government's willingness to legislate and act inconsistently and haphazardly in all matters.

It seems to me this is the most important barrier to entry, although I dislike to beat this particular drum. So far as I could tell, exchange rationing as administered has tended to discourage investment in industries with capital intensive technology, because so much emphasis has been placed on numbers of natives employed and so on. Pegged peso-to-dollar ratios at twice the world peso value, together with little or no preferences to exporters, have discouraged investment in export crops. Laws discriminating against aliens have discouraged wholesaling and retailing. Uncertainties caused by lack of coordinated policies among government corporations have been important. Restrictions on repatriation of capital are said to discourage foreign investment. The only agricultural processing industries in which government controls, participation and regulation have speeded development appear to be textiles, flour milling, and cooperative rice milling and warehousing.

Entry into the essentially new industries of vegetable packing, meat packing, dairy processing, and so on has been slow because of the lack of social overhead investment in such services as market information, grades and standards, improved regulation of public transportation, and extension services. The high capital requirements for integrating so as to furnish all these services for the packing firm, as well as to obtain concentrated farm production of the necessary quantity and quality and to develop a market for domestic packs, has been a barrier. The money market

² Morton R. Solomon, "The Structure of the Market in Underdeveloped Economies" in Lyle W. Shannon (ed.) *Underdeveloped Areas*, New York: Harper & Bros., 1957, p. 138.

has not furnished the necessary credit for such new enterprises, though it might make credit available for a large corporate concern with substantial amounts of conventional collateral.

Differentiation

In considering product or service differentiation in the food industries, a separate set of characteristics would be found as among the importers of quality products with high prestige values, exporters of raw materials, domestic manufacturers and/or exporters of quality products, producers and/or retailers of perishable produce, assemblers and wholesalers of the agricultural staples, and so on. Of course the appropriate national development policies might well vary as among these.

There is much differentiation at the various domestic production, processing and marketing stages for most locally produced agricultural items. This differentiation has little to do with prestige, quality or advertising.

In a recent paper Mueller analyzed assembly and wholesale markets in an underdeveloped economy as monopolistically competitive market structures.³ Typically, he says, there are relatively large numbers of wholesalers and retailers selling differentiated products or services. He refers to several things which encourage this differentiation, each or all of which would apply to agricultural markets in the Philippines. They are: the immobility of buyers and sellers which exaggerates locational differentiation; the considerable reliance on credit by many buyers and sellers which invites credit differentiation, segmentation of the population into economic and social caste systems which provides unique opportunities for differentiation; inadequate market information which permits differentiation based on market ignorance. He points out that these factors provide the demand conditions conducive to monopolistic competition.

Further, since entry into many such enterprises may be relatively easy, any suggestion of high profits may bring additional middlemen into the picture; none of the marketing middlemen may be making excess profits though marketing margins are larger than if differentiation were less. The kinds of differentiation named here suggest a host of appropriate spheres for government action—grades and standards, credit, market news, co-operatives, and so on. And yet because laws and administrative agencies for each of these is at least on the books we are led to another suggestion: the appropriate policies to encourage entry and development of large integrated firms.

The monopolistically competitive case also would apply to land, excepting railroad, and to water transportation. Yet the more mature econo-

³ Willard F. Mueller, "Some Market Structure Considerations in Economic Development," *J. Farm Econ.*, May 1959, p. 417.

mies have long recognized that competition must be regulated in transportation.

For the traditional economic activities, the domestic money markets could be viewed as highly developed. There are enough banks, sufficiently large with adequate peso reserves, with branches widely located and yet centralized into a banking system, to provide competition for borrowers and to finance the larger traditional enterprises that can offer traditional collateral.

In terms of development objectives, however, the organized money market continues inadequate, despite various government credit programs to supplement commercial banks. The chief inadequacies of the money markets are: (a) To finance types of enterprise for which the bankers have no actuarial experience and on which the uncertainties may be great or returns may be low in the short run. Such would include food and fiber processing and market development, production of citrus, cacao, coffee, livestock, vegetables, and so on. (b) To finance small farmers who have no collateral except their crop, at lower interest rates, to improve their competitive position in marketing and to increase their productivity. This may be in traditional or new enterprises.

Essentially, the problem centers on the terms of credit. Recognizing this, the government has established several agencies. Critical examination of the annual reports of these agencies shows that since their establishment the terms of credit have directed the bulk of their loans toward the same kinds of risk as are taken by the commercial banks. The Rural Banks Administration and the Industrial Development Center tend to be exceptions, though both are small scale.

Conclusions

What I've tried to suggest here is that since the most highly developed industries, particularly the newer and capital intensive ones, tend to show the highest degree of concentration, underdeveloped countries may have to learn to live with monopoly as one price of self-sufficiency. We would expect this partly because the market is small (both population-wise and in terms of purchasing power), and can support only a small number of food and cigarette manufacturing firms of a size necessary to integrate into the functions they must perform to make products that will replace imports. In terms of development objectives, a major objective is to develop food, cigarette and textile processing industries so as to save the 25 per cent total dollar exchange now spent on imports of these quality products. This may require heavy investment not merely in manufacturing facilities and technology, but to integrate farm production and market development and to furnish many of the services

which in a developed economy would be furnished by social overhead investment. Perhaps this could follow the model of the sugar industry. The integrators could be the larger farmers, say of 20 hectares or more, which group may be the neglected element in national development policy. The open market cannot be relied upon to manipulate the determinants of output, judging from history. Nor can private enterprise be relied upon to develop these industries as Professor Mehren has said, without some form of government participation. It seems to me that the quality of government must be taken into account in deciding the form of government intervention. In this respect India-Pakistan, where the British left a few hundred of the world's better quality civil servants, or Taiwan, where the nature of the U.S.-Taiwan agreement permits our advisory personnel to participate directly in government decisions, may be sharply contrasted with many of the other new Southeast Asian governments. Many of these new democratic governments lack the capital, the skills and the sense of public responsibility to develop these industries by direct controls and direct ownership and operation, and therefore should rely chiefly on furnishing appropriate incentives, services and education for private investment. If so, the market structures implied are potentially exploitative ones, and are sure to arouse resentment particularly since much of the capital must come from foreign sources. Especially in democratically based governments, serious restrictions and obstacles to their success may result.

The idea that vertical integration and large firms expedite economic development is, of course, not new. As early as 1902, many advocated that the lands in the public domain should be sold or homesteaded in large tracts to permit economic production and processing. Even then local interests argued that they preferred a slower rate of development to rapid development by potential exploiters. In this argument they were cleverly abetted by certain political and economic interests in this country.⁴ Resolution of this reaction to privately promoted development many well be one of the most serious practical problems facing many underdeveloped economies which rely, at least in part, on private enterprise in their development programs. These remarks refer to new agricultural industries. For other industries in which the problem is of a different kind, policies to make the market structures more competitive may be appropriate. These may include improvement of market information and the other requirements of an efficient exchange economy, as well as public policies lowering the barriers to entry.

⁴ House Committee on Insular Affairs, Committee Hearings and Reports, 1902-03, p. 279.

SOME MARKETING PROBLEMS IN PAKISTAN AND INDIA*

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THREE aspects of economic development problems in these two countries are related to marketing organization and will be noted and discussed briefly.

First, that type of marketing analysis widely used in the United States and built around economic efficiency concepts of the firm is not as useful at present as it will be in a later stage of economic development. The marketing facilities and organizations—both for factors and products—are now fragmentary. One vital problem is to develop facilities and organizations to distribute to the villagers who need them the productive factors and information on their optimum use. The channel for products also needs to be opened up. Purchasing power needs to flow from the factor-receiving villagers to producers and distributors of factors, and from consumers or users of agricultural products to their producers. This purchasing power transfer should take place in such a way that proper demand signals reach decision-makers in the different sectors. Other types of information need to flow away from the villagers.

The magnitude of the problem is tremendous. In round terms, India has 400,000 villages and Pakistan 100,000. Marketing services must be made available all over. The vast majority of individual market transactions will involve very small quantities of factors, products and purchasing power. The initial establishment of organizations and facilities (and their maintenance for a number of years) will have to involve considerable subsidy from public sources. It may be many years before purchasers of small volumes of fertilizer, seed or insect or disease control materials can pay the full cost of having the items (and the all-important information about them) brought to their village (or an adjacent one). The same generalization holds for agricultural products.

Provisions of these marketing services need not have a high social cost in the early stages of economic development. The facilities can be made available largely from internal resources while the social cost of employing hitherto underemployed individuals is slight.¹ As development

* Approved for publication by the Director, Arkansas Agricultural Experiment Station. The writer spent 18 months in Pakistan in 1954-55 as a member of the Ford-Harvard team to advise the Planning Board of the Government of Pakistan. The institutional backdrop for economic development is believed to be similar enough in some respects to treat some development problems in Pakistan and India alike.

¹ The social cost of training individuals for these functions may be somewhat higher.

progresses, the competition for labor and other internal resources will rise, along with the real social cost of providing these services.

Immediately, the problem is simply to get these channels set up with the least interference with other parts of the development program,² and with prices attached to the services that will neither leave the services (and attached products) unused nor deposit inflation-feeding economic rent into the pockets of individuals not to be called upon for large, immediate increases in their production of goods or services. Decisions to accomplish these goals will call more for ingenuity in organization and human relations than for elaborate economic analysis. Eventually competition for these formerly underemployed resources will make necessary the kinds of economic analysis that play an important role in economic efficiency in the United States.

The second point is closely related to the first, and is another reason why economic efficiency in the conventional sense is not of overriding importance at this early stage of economic development. Not only is there a vital need for developing freely-functioning marketing channels for factors, products, information and purchasing power, but another and different kind of problem exists to some degree.

What marketing channels there are that reach down to the village are not always reliable. The goods and services marketed—seeds, chemicals, fertilizers, milk, and other agricultural products—are often adulterated, sometimes into complete uselessness or into negative or dangerous usefulness. This practice is stimulated by chronic shortages of vital productive factors and important agricultural products. Short of overcoming these shortages, no sure-fire way of overcoming this problem is apparent. Yet this problem must be solved if increased production of higher quality factors is to bring about concomitant increases in food and fiber for the population and if these increases in production are to result in increased welfare.

The economic problem of establishing markets where none existed before, or of shoring up rudimentary ones, or of improving the effectiveness of existing markets, is quite different in an underdeveloped country with a large volume of underemployed labor from the problem in a developed country of maintaining or increasing efficiency in a going marketing system.

The third point indicates the direction in which the writer believes solutions lie to the above problems, to other marketing problems, and to over-all problems in accelerating the rate of economic growth in low-income countries. It is entirely concerned with factor marketing.

² That is, with the minimum use of resources that are needed elsewhere in the development program.

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Not only do these two underdeveloped countries need large and continuous flows of investment goods—this is perhaps the best-recognized need of underdeveloped countries. Not so well recognized but not much less important are two classes of investment that result in a different kind of capital formation. These are:

1) Investments in the human agent. Most important of all these are investments in all forms of education and research, but quite important too are expenditures on health.

2) Investments in public tangible facilities. Included here are roads and streets, other kinds of transportation facilities, communications facilities, research facilities, water and sanitary facilities, irrigation facilities, forests, urban service facilities, and so on.

Some of these activities require little more than local (hitherto underemployed) labor. Others require resources for which there is at present little competition while still others require local resources that have other important uses. Some require goods or services that can only be obtained by import.

As long as there are in Pakistan and India large numbers of workers whose marginal product is zero or less (in the sense that, if a worker were transferred to another activity, the remaining workers would produce as much or more), then the social cost of allocating their efforts to another activity would be close to zero.³ If the command of these transferred workers over goods and services can be kept from rising along with the command of the household or community left by these workers, then the total production of the workers in their new activities would be a net gain to society. The potential for capital formation of such a technique is tremendous in countries with a large underemployed population, like Pakistan and India. The problem is to develop administrative devices that will allow underemployed labor to make a significant contribution to economic development.

Happily, the activities that generally require the most labor and the least of other cooperating resources are those that increase the investment in the human agent. The writer's value judgments run strongly in the direction of regarding present abilities of humans as being, in many areas (including the low-income counties in the United States), the factor most depressing the rate of economic growth.⁴

³This notion of using underemployed labor for capital formation first came to my notice in the fine little book by Ragnar Nurkse entitled *Problems of Capital Formation in Underdeveloped Countries*, Basil Blackwell, Oxford, 1955.

⁴For more detailed discussion of the importance to economic development of investment in the human agent, see the papers and discussions presented in the session on "The Fundamentals of Economic Progress in Underdeveloped Countries," *Amer. Econ. Rev.*, 49:2, May 1959, pp. 134-178.

Economic development is devoutly desired because it raises the economic welfare of people, and, if it takes place at all, it comes about as a result of decisions made by human beings. Even the intractable institutions that so often bar or slow down development are a result of human decisions and can only be made more compatible with economic growth by human decision.

Not only does development in any country require well-trained, experienced decision-makers basing their decisions on rationality, but these individuals must have other human qualities that are often lacking—dedication, vision and imagination. More dedication on the part of decision-makers will help remove one characteristic that often stifles development efforts in Asian countries. A quest for personal security is sometimes the paramount dedication among business men, civil servants and lay leaders.

This leads me to the observation that a great need in developed and underdeveloped countries is for well-trained, experienced individuals, personally dedicated to the goal of raising the welfare of the people. It seems to me that Dr. Mehren's lament that the marketing system has failed to "commercialize" itself sufficiently really boils down to a failure of the given society to produce enough individuals who can make rational economic decisions in the environment actually found. The willingness of an underdeveloped country to "put up with" intractable institutions is really more passive than it sounds in that it arises from not having enough individuals to make decisions that will make the institutions more compatible with economic development.

INTERNATIONAL MARKET INSTABILITIES WITH PARTICULAR REFERENCE TO LATIN AMERICA

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AS I agreed to take a brief part in this morning's program, I changed the topic from an area focus to a functional focus. This is done deliberately. I see little professional advantage to divide ourselves up into those who deal with Latin American, or Asia, or Europe and confine ourselves to describing types of farming systems, tenure relations, marketing structures and principal products, geographic area by geographic area. In fact, there are many professional *disadvantages* in so doing.

In dealing with domestic issues, the problems are divided up functionally by disciplines and even then subdivided. With this specialization have come the vast scientific advances of the 19th and 20th centuries. Some have argued that excessive specialization poses a need for reintegration and development of better generalists. With this I agree. Still, this is far different from taking a general view of a group of similar societies but without probing in depth into important functional problems.

As the United States develops a greater realization of its international role and responsibilities, some universities are attempting to give attention to the non-western world. One approach is in area institutes—the Soviet Union, the Far East, the Near East and now Africa. But such institutions are not developed for Western Europe or for Canada. Too much is known about these countries. Their problems are dealt with along proper functional and disciplinary lines. Moreover, employers in business and government, even in the State Department, are primarily interested in people with technical and disciplinary qualifications for foreign assignment. They do not look with favor upon employing people who float in an intercultural limbo. Area institutes have trained a number of area specialists who set up new area institutes in other universities. They have produced a series of books which add to our knowledge of cultural and social relationships of a particular area. But they have failed to relate themselves to the broad student body of our universities. They have failed to give focus to the problems in our relations to other countries on which we as a nation must make decisions. For these reasons an area approach, a description of another society, is inadequate to America's expanding international responsibilities.

Let us not as agricultural economists naïvely make the same errors and deal with the world as fragments. I do not argue that we have. Also, lest I be accused of throwing out the baby with the bath water, let me hasten to add that it is inevitable that problems must be viewed relative

to attitudes and traditions—in short, within a cultural matrix. Agricultural Economics itself represents a view that agriculture has special problems which are different from the urban sector of society. We do have special programs and papers on the problems of the South, of the West, of New England. But by and large we communicate and stimulate by analyzing problems of land tenure, production economics, market analysis, price trends, policy relations.

With this long introduction let me turn now to our general topic of market organization and economic development, concentrating on *international* market instabilities. The latter is an important problem for the Latin American societies in which I have a certain cultural reference, but it is a problem which pervades much of the world. This is an aspect of market organization to which Prof. Méhren gave no attention. Moreover it is of immediate and direct responsibility in American policy and intimately interrelated with development policies.

As Columbia, Guatemala and Brazil sell their coffee, Cuba its sugar, Chile its copper, Bolivia its tin, Venezuela its oil and iron ore, Mexico and Brazil their cotton, they find frequent and recurrent price instabilities in the international market. The market organization at times appears to be geared to provide uncertainty rather than stability and certainty. Fluctuations in United States levels of employment, of course, are the major disequilibrating forces. In addition, it appears that private storage and purchase plans tend to exaggerate rather than mitigate price changes. The implications of these fluctuations upon economic development are substantial. As the major trading economy to most of Latin American and as the important source of instability, we in the United States cannot escape a large share of responsibility for this situation.

What are the implications for economic development? First of all, for many countries one or two export products provide 70 or 80 percent of the foreign exchange. Variations in the world price, or more specifically the price which the United States as the major consumer is willing to pay, bring alternate prosperity and frustration. At the far end of a long and sticky marketing channel, Latin Americans find small variations in supply and demand forces are magnified into major price changes. This dependence on a fluctuating international market is an Achilles' heel for these countries.

Foreign exchange earned by exports is directed to several purposes. One of these is interest and carrying charges on current indebtedness. Since this is relatively fixed, it takes a larger cut out of reduced exchange earnings (until in an acute crisis a moratorium is declared).

The remainder of the foreign exchange must fulfill two or three main purposes—consumer demands for foreign consumption goods, tools for

economic development, and sometimes major military purchases from abroad. Programs for economic development require a wide range of imported commodities—machinery, new raw materials, and a variety of services. In addition, it is often necessary to supplement domestic supplies, formerly adequate, because of the expanded internal investment. Rising incomes associated with successful development programs simultaneously expand the demand for consumption goods—razors, lipstick, home permanents, radios, automobiles—"new necessities" for the mass of the population, and luxury goods for the political and economic elite. Both these production and consumption decisions lead to an expansion of imports and pressure on foreign exchange.

A drop in the prices of cacao, coffee, or other export commodities reduces the foreign exchange earnings and forces rationing of exchange through quotas and licensing or puts pressure on the exchange rate. It forces cutbacks in economic development programs, encourages hoarding, and requires a group of civil servants to enforce or try to enforce the regulations. Efforts to float international loans sometimes are geared to these short term problems.

Second, and over the longer run, this situation inevitably leads to escape mechanisms. Each country seeks to protect itself and its consumers from market instabilities. Various devices are used. Through high protective tariffs they encourage local production of formerly imported commodities. Diversification of production may be encouraged by research in new crops—research which may successfully shift the comparative advantage, sometimes at the expense of present exports. They introduce new market structures designed to extract a monopoly price from the world market or to ease the degree of price instability. In other cases, they may attempt to organize international cartels or international commodity agreements to attain the same end through cooperative action among major producers. Exchange rates may be manipulated or quotas established for various classes of imports to discriminate against classes of imports or to encourage particular exports.

The general American reaction and that of our profession tends to be one of dismay at this interference with the free price system and the attempt to improve their terms of trade to our disadvantage. Yet what alternatives does the United States offer them? Through reciprocal trade agreements, we attempt to bargain these protections away. We try to tie them up in agreements not to do this in the future through mechanisms such as GATT. At the same time, we add further to world price instabilities by changing our policies periodically with respect to sugar quotas, other import quotas, embargoes, export sales prices, and so on. We depress world prices of farm products, or at least prevent them from

keeping pace with price rises in industrial products, by establishing a P.L. 480 program which puts additional billions of dollars worth of farm products into the world market. Fortunately, the adverse effects of the latter are not always what they seem to be. But all too frequently they are.

With the resource flexibility of the United States economy and the capital at our disposal, it is easier for us, though still difficult, to change the mix of commodities which we produce than for most underdeveloped countries. Most of the Latin American countries have limited opportunities to develop new export commodities.

If we could take a world view of the problems of agriculture rather than a parochial view, there would be additional reasons for resolving certain internal problems. In other cases the direction of policy would be strengthened. In many respects we as a nation have a great deal of social inventiveness. (The federal-state relation in agriculture is one of these inventions). There is a need for such inventions with respect to world market organization.

Ten years ago the FAO suggested an International Commodity Clearing House which would have internationalized surplus disposal. The United States rejected it, apparently on the basis of cost. Yet four years later we developed a unilateral program which probably costs more.

In the post-war period, Inter-governmental Commodity Agreements have had limited appeal, except in the case of wheat. Even here it appears that the International Wheat Agreement has not attained its objectives, again influenced by the unilateral program of the United States. Past commodity agreements dealt with the quantity marketed, thus lending themselves to price manipulation. If attention were given directly to prices, or possibly to a price-quantity formula which would guarantee certain foreign exchange earnings, uncertainties and instabilities might be reduced.

Unilateral action is also possible. The United States could stock-pile coffee during periods of abnormally low prices and sell it later during shortages. Perhaps there would be less pressure to "stabilize prices upward" than under a domestic ever-normal granary; possibly there would be more. Other ideas need to be developed and explored.

Agricultural economists know both from personal and from professional experience the scissors impact of a price decline at the consuming end of a long marketing channel. The marketing margin between the American coffee consumer and the Brazilian producer is long indeed. Who among us is giving attention to creating new market structures which will encourage growth and development? Who among us is giving at-

attention to the inevitable interrelatedness of foreign and domestic agriculture? Of agricultural and foreign policy?

The development of market structures which will reduce international price instabilities is vital to economic development in Latin America. There are other problems, internal problems, which these countries need to solve. Perhaps we can help in technical assistance programs or student training programs. But the vital problem is one which we all face and all can participate in, both as professionals and as citizens. Let's give it the attention it deserves.

AGRICULTURE IN UNDERDEVELOPED REGIONS

R. L. Tontz, Foreign Agricultural Service

RURAL INDUSTRIALIZATION FOR AGRICULTURAL DEVELOPMENT*

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IN THIS paper the aim is to explore the possible role of rural industrialization as a major vehicle for developing agriculture and the rural communities in the underdeveloped countries. The view is advanced that it is desirable, in the interest of broad-based economic progress in the underdeveloped countries, to achieve early integration of industry with rural and agricultural development. To enlarge the impact on the rural economy and to perform other economic and social benefits to the nation, decentralization of industry is proposed as a means of bringing underdeveloped regions and agriculture into the mainstream of development and of planning for the large population increases that may be in imminent prospect.

In recent years there has been extensive discussion in economic literature about the respective roles of agriculture and industry in economic development. Most prominent has been the controversy whether the desirable policy is "industry first, and agriculture to follow," or whether early simultaneous development of these two sectors is preferable. The wisdom of the policy of developing industry and agriculture as separate and isolated economic sectors is questioned, especially the position that the development of industry should precede the development of agriculture. To build each sector on solid economic foundations, development of the one should reinforce and strengthen the other. Multiple economic cross-linkage is necessary for the purpose. To transform subsistence agriculture, agriculture must be made interdependent with the rest of the economy.

The problem is presented from the viewpoint of such predominantly agricultural countries as Pakistan and India, which have extremely low incomes per capita, dense and rapidly growing populations, and serious foreign exchange problems—countries unusually handicapped in making rapid progress in development. In this kind of milieu it seems essential

* Research Program on Small Industry Development. Misc. Paper No. 3.

** I should like to thank Eugene Staley, Edward S. Prentice, Joseph E. Stepanek, and Guy Benveniste for comments on an earlier draft of this manuscript.

to make substantial investments in the development of agriculture and the rural communities in the early stages of economic development, as the very possibility of executing the development program is at stake. Early expansion in the supply of food and industrial crops is required for the following reasons:

1. To provide for the rapidly growing domestic demand for food and agricultural raw materials;
2. To expand exports and increase earnings of foreign exchange for financing the importation of development goods; and
3. To obtain increasing revenues from agriculture to finance the development program.

The significance of these points is illustrated by the recent experience of Pakistan and India.

Effects of Slow Agricultural Progress on Economic Development

Both countries made large investments in agriculture and irrigation in their development programs. In the First Five Year Plan, 1955-60, Pakistan planned to invest Rs. 4.20 billion, or about 45 percent of the entire expenditure for development. During India's First Five Year Plan 1951-56, 32 percent of the entire allocation to development was planned to go into agriculture and irrigation, a total of Rs. 7.41 billion. In both countries 16 percent of the total development expenditures were to be devoted to agriculture, as distinct from irrigation investments. The importance of agricultural investments in development continued to be recognized in India's Second Five Year Plan when the total planned investment was raised to Rs. 9.49 billion, but proportionately this allocation represented a decline to 20 percent of the over-all program.¹

In spite of these heavy investments in the agricultural sectors at the very beginning of their planned development efforts, both India and Pakistan are encountering grave difficulties. Imports of food are costing India about \$500 million and Pakistan about \$80 million a year;² in both cases these imports cost a significant portion of foreign exchange earnings. These two countries became independent in 1947 approximately at the time when the demand of the growing population for food was beginning to exceed the domestic supply. Also, population may be growing at an increasing rate, close to 2 percent annually instead of at the 1.4 percent rate used in recent planning estimates. Thus the population may be growing annually by 8 million persons in India and 1.8 million persons in

¹ The allocation to agriculture as such was raised from Rs. 3.57 billion to Rs. 5.68 billion, but this change represented a decline from 16 to 12 percent of the total Plan.

² *The Economist*, "India Focuses on Food," June 6, 1959, pp. 951-52 and "Pakistan's Bootstraps," September 6, 1958, p. 766.

Pakistan. These population gains require about an additional 1.7 million tons of food grains each year.³

Failure to meet domestic requirements of wheat and rice, particularly, has reduced the quantity of foreign exchange available for industrialization and infrastructural development. At the same time, it has not been possible to increase earnings from agricultural exports, though there have been some gains from manufactured jute and cotton textiles.

Communist China had a similar experience during the First Five Year Plan. Between 1953 and 1956 about 7 percent of the annual output of consumers' goods, mostly agricultural products, was exported to earn foreign exchange for capital formation. The Chinese experience has particularly reflected the key importance of agriculture as the basis for maintaining a high rate of capital formation and for maintaining, if not increasing, per capita consumption. This lesson was learned from the poor harvest of 1956. As a result there was a very substantial increase in the allocations to the agricultural sector for the Second Five Year Plan, issued late in 1957, which incorporated the view that "industrial development requires simultaneous development of agriculture."⁴

Pakistan's First Five Year Plan called for a production increase of 13 percent, but until now the Development Program has had no significant impact on increasing agricultural production.

In India the view seemed to prevail that the First Five Year Plan, ending in 1956, had been successful in raising agricultural production about 15 percent.⁵ But a more sober evaluation suggests that most of the progress of Indian agriculture may have been due to favorable weather conditions.

That the three most populous countries of Asia are faced with severe development problems due to the failure to obtain an adequate development of rural resources, in spite of very heavy investments, is indicative of the difficulties inherent in developing the agricultural sector. Their experience also serves to question the theory of resource allocation which discourages investments in agriculture in favor of "urban investments" and heavy industry in the early stages of development.⁶

³ Ansley J. Coale and Edgar M. Hoover, *Population Growth and Economic Development in Low-Income Countries—A Case Study of India's Prospects*, Princeton, 1958. Chap. IV, pp. 29-42, Table 7. The projections for the period 1961-71 are at the annual average rates of 1.8 percent, assuming a 50 percent decline in fertility in the period 1956-1981, and 2.5 percent, assuming fertility is unchanged.

⁴ Choh-Ming Li, *Economic Development of Communist China—An Appraisal of the First Five Years of Industrialization*, University of California Press, Berkeley and Los Angeles, 1959, pp. 219-221.

⁵ Government of India Planning Commission, *Second Five Year Plan*, New Delhi, 1956, p. 255.

⁶ Stephen Enke, "Speculations on Population Growth and Economic Development,"

The theory rests on a number of assumptions which require further investigation. It would lead to recommending a pattern of development placing primary emphasis on large scale industrial investment, and postponing improvement in the living conditions of the people. This is a policy which recent history shows can be implemented only by severe repression of the people, and is impossible of execution within a democratic framework. The theory rests on the primary assumption that additions to income resulting from investments in agricultural and rural pursuits will be largely consumed rather than reinvested, and that the effects of investments in this sector of the economy will be to stimulate population growth. We will come back to this argument again later.

The Problem of Raising Agricultural Productivity

It is axiomatic that improvements in agriculture which raise agricultural production will be due to the adoption of improved technology.⁷ A central theme of this paper is that development policy should recognize that industry, which is the source of improved technology, is the instrument for bringing about change. This means recognizing that industrialization is the dynamic element in the economy, and that if suitably directed it may give dynamic momentum to the development of all aspects of agriculture and village life.

A fair degree of success is being attained by the community development programs of the Subcontinent in bringing about change in the life of the villages, including some measure of progress in agriculture. But so far as the broad impact of this program on agricultural production is concerned, it is a shadow of what it could be.

Based upon several months of recent field work in the interior of Pakistan as a member of a Stanford Research Institute team, the writer concluded that to get agricultural production to respond adequately, it is necessary to introduce a much greater investment on the industrial side to provide the goods—materials and equipment—needed by the cultivators to raise agriculture to new technological levels. It was observed that better farm practices can usually be introduced only with the use of improved agricultural equipment. This emphasizes the key role of the industrial economy in the development of agriculture.

There are still vast steps to be traversed in improving agricultural implements used on the Subcontinent. In the operations of harvesting and

Quart. J. Econ., Feb. 1957, 71:1, pp. 19-35; and Walter Galenson and Harvey Leibenstein, "Investment Criteria, Productivity and Economic Development," *Quart. J. Econ.*, Aug. 1955, 69:3, p. 346.

⁷Expanding acreage is an important source of additional agricultural productive capacity, but in the long run more productive use of the factors applied to agricultural production is essential even on such land.

threshing, for example, it is unfortunately impossible to record any progress over the ancient methods. Though agriculture is backward, it is doubtful that any real difficulty would be encountered in getting rapid acceptance of improved equipment by cultivators. The usefulness of the village level worker as an advocate of improved farm mechanization has hardly been tapped. The outstanding problem faced by all manufacturers is that of getting an adequate supply of steel and other raw materials, even in India with its significant small-industry program.⁸

Establishing Economic Interdependence with Agriculture

In terms of the concept of increasing economic interdependence, furnishing the implements and tools to agriculture for modernization provides important forward linkage.⁹ A second important approach to integration is to stimulate a growing market for the products of agriculture in order to encourage expanding farm production. This backward linkage to industry is provided by establishing firms for processing and improving the marketing of agricultural products. In addition, the manufacture of equipment for the agricultural processing and handling industries is essential for putting new and growing demands on agricultural production.

The demand for farm products can be expanded in several major ways:

1. By expanding the demand for processed foods.
2. By processing agricultural wastes and by-products to augment the feed supply for livestock.
3. By increasing the demand for industrial crops, including oil and fiber crops, textiles, manufactured jute, etc., and chemical by-products.

In breaking away from the pattern of subsistence farming, in which each family literally produces its own food needs, diversification of production of crop and livestock products is one of the effective ways of making farm lands generally more productive. However, this process depends on increasing the industrial demand for farm products and broadening the diet of the people.

As Ragnar Nurkse has pointed out, the problem of increasing production is to break the circularity of production and markets.¹⁰ This is

⁸ For example, see Development Commissioner, *Small Scale Industries*, Small Scale Industry Analysis and Planning Report No. 14 (W), Agricultural Implements (Western Region), pp. 10-13. The allocation of Rs. 300 million in the First Five Year Plan was raised to Rs. 2.0 billion in the Second Five Year Plan. These investments were 13 percent and 42 percent, respectively, of the entire allocations to industrial development.

⁹ Albert O. Hirschman, *The Strategy of Economic Development*, New Haven, Yale University Press, 1958, Chap. 6, pp. 98-119.

¹⁰ Ragnar Nurkse, *Problems of Capital Formation in Underdeveloped Countries*, Oxford University Press, 1953.

one of the main explanations of why progress in agriculture has faltered and failed. The farmer needs to have some certainty about increasing yields, an assured market, or a price incentive, in order to produce a new crop or make investments in new farm practices and equipment. Frequently industrial processing is essential before consumer demand for farm products can be increased and before the livestock feed supply can be increased. For example, the introduction of canning plants to process fruits that would be wasted provides a market for these products in the off-season, raises the price to the farmer during the harvesting season and enables him to sell to a much larger market. The country gains from a more complete utilization of the products of the agricultural resources.

Industry to Provide Rural Employment

Another point of contact and integration with industry is the provision of industrial employment and a source of additional income to the surplus rural population. To achieve this, the investment program should be twin-pronged: first, to use labor more effectively in agriculture, both intensively and extensively; and, second, to draw off labor to industry and other non-agricultural sectors. The extent to which labor can be absorbed from agriculture into industry will be vital because it will determine the extent to which productivity can be raised in the economy.¹¹ There is also considerable scope in providing seasonal industrial employment between peak farm seasons, including the monsoon period when farm people in certain regions of the Subcontinent may be unemployed from four to six months of the year.

It is to be hoped that some labor intensification in agriculture can be obtained for a time, not only by extending irrigation, but by crop and livestock diversification, and by the use of improved equipment, breeding stock, and production materials, so as to reduce the pressure for additional industrial jobs in the early stages of development. As population grows in these newly developing countries, the proportions employed in agriculture will decline. For a time there may be comparative stability in the numbers engaged in agriculture, but as productivity increases in agriculture and the attraction from the nonagricultural sectors continues, some decline of the absolute numbers employed in agriculture may be expected. This drawing-off process will work imperfectly because capital formation in the nonagricultural sectors may not provide enough jobs, with the result that considerable disguised unemployment may continue in rural areas even for extended periods of time.

¹¹ United Nations, Economic Commission for Latin America, *The Economic Development of Latin America and Its Principal Problems*, Lake Success, New York, 1950, p. 45.

Historical Tendencies Toward Urban Concentration

Historically, people drawn off from rural pursuits have been attracted to the large cities. Growing urban concentration has accelerated in the industrially advanced as well as in the less industrialized countries during the past two decades, accompanied by general congestion, the growth of slum conditions, and a strain on public utilities. In the higher income countries this phenomenon has been accompanied by the large scale introduction of the automobile, which has encouraged and facilitated a flight to the suburbs. On the Subcontinent the automobile will be less of a factor for some time in facilitating suburbanization. Moreover, it is doubtful that the public transportation system will grow sufficiently rapidly to prevent congestion from getting worse.

Gunnar Myrdal has pointed out that the growth of industrial centers feeds on itself, a phenomenon which has been observed throughout industrial history.¹² Obviously, as population increases, industrialization must grow more rapidly to absorb the growing labor force, with the prospect that the large urban centers will continue to grow ever larger. Increasing urban concentration in the densely populated countries will cause additional social, political, and economic strains as time goes on unless some positive policies are initiated to improve conditions or to slow up and reverse the process.

Social scientists have been giving increasing attention to the problem of urban concentration but do not agree as to what is the most suitable course of action for a developing country to follow: Whether a government should allow the natural economic forces to continue unhindered their attraction of industry to the larger agglomerations of industry and population; or whether it would be a wiser course to intervene in a process which may be contrary to the best long-run interests of society.

Concentration versus Decentralization

Substantial social overhead costs are attributable to urban concentration. These costs are of special importance in the underdeveloped countries,¹³ and comprise the following: (1) social costs associated with the dislocation of people from rural employment and their absorption into new employment in the concentrated urban industrial environment; (2) costs associated with the provision of living amenities; (3) costs attributed

¹² Gunnar Myrdal, *Rich Lands and Poor—The Road to World Prosperity*, New York, Harper and Brothers, 1957, Chapter III, pp. 23-38.

¹³ H. G. Aubrey, *The Place of Small Industry in Economic Development*, New York, Institute of World Affairs, May 1951, p. 34.

to the operation of large scale industry; and (4) costs due to the provision of transportation and middlemen services.

Among the economic overhead costs are the provision of housing, water, and sanitation, hospitals, schools, streets and lighting, policing and fire protection, marketing facilities, and other amenities usually associated with urban life. In the case of housing, standards must be higher than in the villages if slum conditions are to be avoided.¹⁴ Health and sanitation provisions are much more costly in the cities than in the villages, even in the underdeveloped countries. Some of these facilities and services are not needed in the villages or can be satisfied with lower standards and investments.

Attention has also been drawn in the literature to the social overhead costs included in the overhead costs of large scale enterprises, many of which represent a strain on factors in short supply in the economy, such as highly skilled technical and administrative personnel. In small plants, a larger part of the total investment can be used for the productive processes than in large scale industry.¹⁵ Finally, the concentration of industry places an increased strain upon transportation facilities, including the railways and road transport, required for the movement of food products, fuel, and other goods, as well as passengers, arising from the migration of village people in urban centers.¹⁶

Investment in an improved road network may not be greater when industry is decentralized; whether it is will depend on how far decentralization is extended into the rural areas. Primary and secondary roads are being built in most countries anyway under national or community development plans. But there is the possibility that additional investment in transportation equipment may be necessary.

The Report of the Indian Village and Small Scale Industries Committee stressed the vital importance of rural electrification in the development of industry on a decentralized pattern, and recommended that electrification be extended with this object on a planned basis and with national support.¹⁷

With the decentralization of industry, especially of the small scale enterprises, are associated certain costs which must be borne by the government, but which represent external economies to industry.¹⁸ Of

¹⁴ *Report of the Village and Small Scale Industries Committee*, Planning Commission, Government of India, Delhi, October 1955, p. 32.

¹⁵ Aubrey, *op. cit.*, p. 35.

¹⁶ Peter B. Diebold, *The Interdependence of Agricultural and Industrial Planning in an Underdeveloped Country, Economics and Finance in Indonesia*, November 1953, Vol. VI, No. 11, p. 689.

¹⁷ Village and Small Industries Committee, *op. cit.*, p. 23.

¹⁸ Tibor Scitovsky, "Two Concepts of External Economies," *J. Pol. Econ.*, April 1954, pp. 143-151.

special importance among these are industrial research, extension, credit services, industrial estates, and common industrial facilities.

Since industrial investment in a community tends to generate additional investment and growth, the importance of decentralizing industry by establishing industrial nuclei throughout a country can be appreciated. The effects of industrialization will thus be widely distributed and dispersed, and the impact will be quickly felt on the demand for labor and the demand for farm products. The effect on rural people will be direct instead of through the trickle-down process.

Another important, and perhaps vital, by-product of industrial decentralization is the opportunity it would create for improving amenities of life and culture in the rural areas so as to make it sufficiently attractive for the people to stay and make the smaller communities their way of life instead of migrating to the large cities. Conceivably other influences of urbanization would become apparent and would be adopted by the rural people. Important among these would be the adoption of the mores of the cities as reflected in reduced birth rates. Whereas the critics of early-stage investment in agriculture would prefer to increase the concentration of the urban population with the object of reducing birth rates, it would appear more economical and more effective for development to bring the social value of smaller families to the country. Another influence useful in development would be the more dynamic attitudes inherent in urbanization.

If these arguments in favor of rural industrial decentralization are accepted, it would seem that underdeveloped countries should bend their efforts to put such a policy into operation in the interest of speedy and balanced economic growth.

The Pattern of Industrial Decentralization

The Karve Committee of India, just mentioned, has given one view of the decentralized industrial pattern envisioned under such an approach.

The pattern of industrial activity that should gradually emerge is that of a group of villages having its natural industrial and urban centre. These small urban centres will be similarly related to bigger ones. Thus a pyramid of industry broad-based on a progressive rural economy will be built up. In such an organization small centres can experience a cooperative interest in the bigger ones, and these latter would develop a genuinely supporting instead of an exploitative relationship towards the smaller towns and the countryside.¹⁹

Experience in the United Kingdom, particularly, has demonstrated the feasibility of a positive industrial location policy as a most effective method of affecting or controlling the distribution of the population. This has been a core principle in regional planning. By using the concept of

¹⁹ Village and Small Industries Committee, *op. cit.*, p. 22.

industrial estates and related measures, efforts have been exerted since the late thirties toward reducing the trend of industry to locate in the south of England, and to encourage industry to move to the depressed development areas afflicted by chronic unemployment.

Both Puerto Rico and India are successfully using industrial subdivisions or estates as devices to promote industrial decentralization policies. The Puerto Rico Economic Development Administration is pursuing a decentralization pattern along very specific lines, more so than India, with differential factory rentals to attract industry to the more distant and less favorable locations.

Faced with the economic realities of the underdeveloped countries, industrial decentralization should be executed as a phased policy, in part to keep within available investment resources and in part to build soundly. Thus there might be a step-wise penetration of interior regions by establishing flourishing industrial nuclei away from the large urban centers. Eventually it may be feasible to extend industry down to the small towns and large villages. Wherever possible, locations should be selected where industry exists in viable form, and efforts should be made to turn these into industrial nuclei with good prospects of generating further growth. If properly utilized, industrial estates are an efficient device for achieving this object, especially as it is possible to build into them certain services to industry, such as industrial advisory services, supervised credit, and common facility services to provide some of the economies of large scale to small industry. It is of interest to note here that the Indian Government has recently been advised to establish small rural industrial estates to provide employment and to produce goods required in the rural areas.²⁰

In putting a rural industrialization program into effect, considerable attention should be devoted to selecting industries that will be of special usefulness in uplifting the way of life in the rural areas and increasing agricultural production. Among these the following appear to be the major important categories:

1. Agricultural implements, including processing equipment;
2. Agricultural industries processing foods, feeds, and industrial products;
3. Mechanical repair facilities;
4. Capital goods for manufacturing implements and processing machinery;
5. Essential consumer goods industries.

An industrialization program with this kind of emphasis is on the point

²⁰ *India Economic Newsletter*, Vol. 1, No. 12, June 1959, published by Information Service of India, Embassy of India, 2107 Massachusetts Avenue, N.W., Washington 8, D.C.

of being implemented on a pilot basis in a project jointly sponsored by the Pakistan Government and The Ford Foundation. The proposed Rural Industrial Service is an action-oriented project with research and technical advisory services built into the organization.

Overcoming Factors Critical to Industrial Decentralization

The major problem in decentralizing industry may be to find the entrepreneurship required to develop the industrial nuclei in the regional areas. This depends on the extent to which industry is pushed out from the large concentrations of population. Such urban centers are generators of capital and entrepreneurship, which explains why they encourage the clustering of industry. The urban cultural milieu in general and industry in particular produce technical people and individuals controlling blocks of capital which are spawned by existing industry. They are likely to see industrial opportunities relatively close to existing industry. Moreover, many of the industrial opportunities are based on serving the existing enterprises. Thus the problem is how entrepreneurship can be attracted to the new industrial centers. It is also quite essential to see that the problem of entrepreneurship is intimately tied to the problem of obtaining capital for industrial investment. As a general rule both have been obtained in the past from existing industrial centers. And experience has shown that there are considerable costs involved in obtaining the movement of entrepreneurship and capital.

It may be, therefore, that there are real economic limits in the extent to which decentralization can be carried in practice into regions beyond industrial centers of some size. It may not be wise to set up industries in the villages unless suitable entrepreneurial talent is available and the enterprises can be made viable. It may be feasible to stimulate industry in urban centers down to the small cities and large towns without incurring excessive expenditures. This may be especially the case in relatively large communities with important technical educational training centers which can serve as generators of entrepreneurial, managerial, and supervisory personnel. In other words it would seem to be quite possible to develop entrepreneurs by stimulating them in industry and by supporting suitable training institutions. The other major bottleneck—investment and working capital—will have to be provided by development banks and a renovated commercial banking system designed to operate in the interior regions.

Finally, there might be another approach to the problem of rural industrialization; namely, making the village the nucleus for providing entrepreneurship and investment capital. There has been some success in using the village as the industrial nucleus. The Israeli kibbutz has been operated as an economic unit on a collective cooperative basis for a long time.

The kibbutz farm has provided managerial and supervisory personnel from its membership. In the course of time manufacturing activities have grown up in many of these economic units, due to previous industrial training or interest of some members or to performing essential repairing or manufacturing services. In other cases, the kibbutz saw opportunities in agricultural processing for more effectively disposing of farm products. A collective farm of this type is an effective device for accumulating capital, and in the course of time it must necessarily expand to provide for the growth of the community by setting up new farm colonies or by investing in industrial enterprises. The members are not paid wages, all their meager needs are supplied by the community, and wealth must necessarily accumulate.

With the kibbutz acting as entrepreneurial agent, it provides the entrepreneurship, the capital, and the supervisory personnel. Some of the factory labor is furnished by the kibbutz, and other labor, especially unskilled workers, is obtained from nearby urban areas.

It would seem that the recent reorganization of the Chinese villages into communes is rather along these lines. The communes appear to have the same objectives as those developed by the kibbutzim in the course of their historical evolution.

Collective organizations of this type seem to require the drive of an ideology and outside pressure to be successful. The kibbutzim had the drive of the ideology of Zionism, which brought it together in the first instance. Secondly, it was held together by the dangers of colonization and general antagonism with which it was faced in the early period of development. Recent evidence seems to show that these cohesive forces are weakening and that the kibbutzim may be losing their driving force and will to survive.

Such conditions and circumstances are difficult to duplicate. Without the driving ideology, the willingness of individuals to subordinate themselves, and the press of outside circumstances, the role of the commune as capitalist does not appear dependable except perhaps on a limited scale. It would seem, therefore, that the most effective way of decentralizing industry along broad-based lines throughout the economy is to provide wide scope for individual action, to establish institutions for generating entrepreneurship, and to develop decentralized financing institutions for making available the capital required for industrial development.

Summary and Conclusions

It has been pointed out in this paper that the development of an antiquated agriculture to new technical levels and higher production is a difficult, expensive, and time-consuming process. Nevertheless the

development of agriculture is essential at an early stage in order to feed the population and finance the development of the country. To achieve rapid progress it would seem that the interdependence of industry and agriculture should be carefully planned. Industry should introduce the dynamic element into agricultural progress by supplying the necessary equipment and production materials, by expanding the demand for the resources of agriculture, and by providing employment for surplus rural labor. It is suggested that rural decentralization of industry might be a desirable policy to follow in industrializing the country. On the one hand, it would head off the tremendous social and economic costs which might be in store if the large population growth anticipated in the future is concentrated in ever-increasing degree in the large urban centers. On the other hand, industrial decentralization would be an effective method for rapidly increasing agricultural production, promoting rural development, and bringing urban influences to rural areas. These influences would assist in speeding up modernization and, possibly by inducing a restraining effect on population, might enable solid building for higher per capita income growth. Capital and entrepreneurial shortages might be bottlenecks in such a program, but it should be possible to overcome them and develop effective methods for achieving industrial decentralization.

USE OF SURPLUS AGRICULTURAL COMMODITIES IN THE ECONOMIC DEVELOPMENT OF THE FAR EAST

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THE purpose of my paper was to have been a discussion of the role of agriculture in the general economic growth of the less-developed free-world countries of the Far East.¹ India, representing 56 percent of the population and 50 percent of the agricultural production of these countries, also has the most comprehensive plan for economic development. Since it has now finished the third year of its Second 5-Year Plan, the experience of India supplies a good demonstration of the progress and problems of agricultural development under formal plans in the Far East. Therefore, I had developed my paper around the Indian example.

Fortunately, last week I had the opportunity to read Dr. Bredo's paper and found that he also was using India's experience as the basis for his discussion of economic planning. Thus, many of the points which I had intended to present have already been ably covered by Dr. Bredo. Therefore, I will review only briefly agricultural development in this region, then I will shift the subject of my paper from the role of Far Eastern agriculture in economic development, to the role of U. S. agriculture—specifically, U. S. surplus agricultural products—in the development of the Far East.

Agricultural Development Programs

All but one of these less-developed countries of the Far East have achieved independence since World War II. With political independence has come a demand for economic progress and social improvement, and all but Thailand have embarked on multi-year plans for economic development. These have as broad goals the more efficient use of human and natural resources and a higher level of living.

Most of these plans include all sectors of the national economy. Since agriculture is the biggest sector in the economy of these countries and is the base upon which the industrial and other economic super-structure must be built, agricultural improvement receives considerable emphasis. Large-scale programs have been undertaken for increasing farm production by such methods as expansion of irrigation, increased use of fertilizer and insecticides, improved seeds, mechanization, land reform and extension services.

Despite delays in getting under way, most of the countries have made

¹ Afghanistan, Pakistan, India, Nepal, Ceylon, Burma, Thailand, Laos, Cambodia, South Vietnam, Malaya, Indonesia, Philippines, Taiwan, and South Korea.

a good start on some phases of their economic development programs and have demonstrated some success. In 1959, total agricultural production in the non-communist Far East was 20 percent higher than in 1952-54, and 36 percent above the pre-war average.² The 1958 index of industrial production was up 60 percent over 1953, and the volume of trade increased about 40 percent.³

The very successes attained in economic development and social improvement have brought on some of the serious problems now facing the Far East. Improvement in health and sanitation has set off a virtual population explosion throughout the area. Most of the countries are growing at the rate of 2 to 3 percent per year; only Japan and Burma are maintaining their growth at about 1 percent.⁴

Population growth is only part of the story. With economic development and some improvement in productivity, per capita incomes have increased slightly throughout the Far East. Since a large proportion of the people are living at a subsistence level, much of this increased income has gone for food.

At the same time that the consumption of agricultural products has increased so sharply, agricultural production—except for that of Japan and Taiwan—has not increased nearly as much as had been planned. This lag was due partly to poor weather in 1957 and 1958, partly to delay in completing irrigation and other land reclamation projects, and partly to difficulty in obtaining enough fertilizer. But an over-riding reason was the difficulty of changing the agricultural practices of illiterate farmers who farm small plots of land, have limited financial resources, and who are bound by age-old customs. Per capita production in the Far East in 1959 was still slightly below the pre-war level.

A major purpose of Far Eastern agricultural development is to provide the investment capital—domestic and foreign exchange—to finance the over-all economic development plan. However, much of the greater production that was designed for export has been used at home, and imports for consumption have increased instead of decreasing. Before the war, the Far East had a net annual export of almost 3 million tons of food grains, but it must now import over 10 million tons.

Because of this unexpected increased consumption many of these countries have serious unfavorable foreign exchange balances. Most of them suffered a decline in foreign exchange reserves between 1956 and the end of 1958; India's reserves fell to almost one-fourth of the 1955 level. Exceptions were Malaya, Thailand and Taiwan.

² *Indices of Agricultural Production for the Far East*, Foreign Agr. Serv., U. S. Dept. Agr., Nov. 1959.

³ *Yearbook of the United Nations*, 1958.

⁴ *Future Growth of World Population*, U. N. Population Studies No. 28, 1958.

U. S. Aid in Economic Development of the Far East

One of the really new developments in world affairs since World War II has been the growth of aid to countries in need. The United States has taken the lead in this activity and has done more than any other country in contributing to the relief, rehabilitation, reconstruction, and economic development in foreign lands. Before 1954 most of this aid went to Europe, but since then the bulk of it has gone to the less-developed areas of the world. In fiscal year 1959, 54 percent of the U.S. economic aid went to countries of the Far East. The International Cooperation Administration has about 3,500 U.S. personnel and 2,400 local employees in these countries in the technical assistance program.

The agricultural Trade Development and Assistance Act, commonly called Public Law 480 or simply P.L. 480, was enacted in 1954. It provides four methods for moving surplus farm products of the United States into world consumption: (1) sales for foreign currencies, (2) gifts of food for famine relief and other emergencies, (3) donations through voluntary relief agencies, and (4) barter for strategic materials.

The largest P.L. 480 program is under Title I, which provides for the sale of U.S. farm surpluses to friendly countries with payment received in local currency of the recipient country. The currencies received pay many U.S. Embassy and other expenses, finance important educational, research and information programs, and promote U.S. agricultural trade. From 50 to 85 percent of the funds are used for loans and grants to foreign governments and loans to business firms for economic development.

Since the beginning of the program through November 1959, 170 Title I agreements have been made with 37 countries covering exports of \$3.7 billion of agricultural products, in terms of world market prices. Eleven of these countries are in the Far East and they account for 42 percent of exports programmed—India alone for 21 percent.

P.L. 480 has come at an opportune time for the countries of the Far East since it has enabled them to purchase in their own currency the extra requirements of food and fiber which their diminishing foreign exchange balances would not otherwise permit them to buy, and has prevented inflationary price rises. It has also provided them with additional investment funds to bolster their economic development programs.

Role of P.L. 480 in India's economic development

In 1956, when it was apparent to India that crop production would fall below expected levels, import requirements were increasing, and foreign exchange reserves had fallen sharply, India requested a P.L. 480, Title I program from the United States. This agreement was signed in August 1956, and was intended to run for three years with a total market value of

\$362 million, including ocean transportation. This included 3.8 million tons of wheat, 200 thousand tons of rice, 247 thousand bales of cotton and some other agricultural commodities.

Although this was intended for a three year period, food deficits became so serious in India (partly because of unfavorable weather) that the food commodities were all imported in less than two years and another agreement was signed in June 1958, for 580 thousand tons of wheat and 200 thousand tons of coarse grains for human food.

In September 1958, a new Title I agreement was signed with India for 2.8 million tons of wheat and additional coarse grains. Although this was planned for a period of 1½ years, most of the grain was shipped before July 1959, and in November 1959 India signed still another agreement which included 3.0 million tons of wheat, plus rice, coarse grains, cotton and tobacco.

These shipments of surplus agricultural products have been a lifesaver for India. During the past three fiscal years India has imported 8.6 million tons of wheat. In fiscal year 1957, 57 percent was purchased for rupees under a P.L. 480 program; in 1958, 77 percent; and in 1959, 90 percent. Alternatives would have been serious food shortages in the large cities of India, retardation of the Second 5-Year Plan, or complete exhaustion of foreign exchange reserves.

Also, more than 80 percent of the funds generated from these sales or more than ¾ billion dollars in rupee equivalent have been set aside for use by India as grants and loans for economic development. For some time these loan funds were not allocated to specific projects, but were held by India as bank reserves against which borrowings were made to finance economic development. Recently, however, loans for development projects have been made.

Prospects for the future

The situation in India which has prevailed for the past few years is probably going to continue for some time. It is unlikely that agricultural production will reach anywhere near the 28 percent increase which was projected in the Second 5-Year Plan. Some increases will be obtained through expansion of irrigation and some improvement in yields. However, crop yields in India are among the lowest in the world and have shown little increase during the two plan periods.

India has made great strides in its community development program, but improvements in agricultural production are going to come about slowly and it will probably take more than a generation for Indian agriculture to pass out of the under-developed category. The example of agricultural development in Japan gives hope to India and the rest of the Far

East. However, it must be remembered that it has taken Japan more than 80 years of development to reach the state it is now in, and one cannot expect other countries to accomplish it in a very brief span of years.

It is likely that it will take at least five years instead of the remaining two for India to achieve its Second 5-Year Plan goal of an 81-million-ton production of food grains. Annual consumption will probably increase during this period to a level of 87 million tons, leaving a net food grain deficit of 6 million tons. Of this, India could probably be expected to import about 1 million tons commercially. Because of the rapidly growing population in Asia, sufficient rice probably will not be produced in the region to supply consumption needs so most of the additional food grain imports will have to be wheat.

It is estimated that during the next 5 years, India will have to obtain about 25 million tons of food grains, mostly wheat, above commercial imports, if food requirements are to be met. This will allow for increased consumption due to population growth and economic development, and the establishment of national food reserves. It also anticipates one year in which crop production is greatly reduced because of failure of the monsoons.⁵ Most of these requirements for food grains probably will need to come from the United States under concessional sales. However, additional quantities will probably also come from Australia and Canada.

If these quantities of grain plus certain amounts of fats and oils, dried skim milk, cotton and tobacco were sold to India under P.L. 480, Title I programs, the rupee equivalent of approximately \$2 billion would be deposited to the U.S. account in India over the five year period. If about 80 percent of these funds, or \$1.6 billion worth of rupees were made available to India as loans and grants for economic development, this would amount to about 10 percent of the total investment of a five year plan the size of the Second Plan.

The importation of these commodities under P.L. 480 programs would also be important to India in saving its limited foreign exchange for its development programs instead of having to spend it for food and fiber imports. Over the next several years, India is going to have difficulty in obtaining the foreign exchange required for normal government expenditure and for economic developments. The traditional Indian exports of cotton and jute manufactures and tea are entering declining world markets, the cost of imported capital goods to carry out development pro-

⁵ A study recently completed in India by an agricultural production team sponsored by the Ford Foundation concluded that, at the present rate of increase of production and consumption, by 1965-66 (end of the Third 5-Year Plan) India would have a deficit of 28 million tons of food grains (including 10 million tons for reserves). *Report on India's Food Crisis and Steps to Meet It*, Government of India, April 1959.

grams is increasing, and much of the additional production from the new factories in India is finding a ready market at home and is unlikely to become important as a foreign exchange earner.

As a result of agricultural and industrial production not reaching projected levels, gross national income will not increase as much as expected by the end of the Second 5-Year Plan. So India will not have sufficient financial resources to provide for the investment in the Third 5-Year Plan, now contemplated to be larger than the Second Plan. Therefore, the Third Plan is likely to require higher level of deficit financing and more investment capital from external sources than the Second Plan. Some of this increased investment could be generated by the sale of U.S. surplus agricultural commodities.

Planning the Utilization of Agricultural Surpluses in Economic Development

With this picture of the future before us (with smaller versions of it in most of the other less-developed countries of the Far East and throughout the world) and with the experience we have gained over the past five years, it should be possible for us to plan more effectively for the efficient utilization of our agricultural surpluses for economic development.⁶ The surpluses now in being and those which will be added in the next few years are likely to keep us in the surplus utilization business for several years to come.

In over-populated, under-developed areas like the Far East, where unemployment and under-employment are wide-spread, increases in employment through investment in economic development projects will raise real incomes. Because of the high income elasticities of demand for food in these countries, most of the increase in income will go for food, principally those which the United States has in surplus. In a study made by FAO in India it was estimated "That 40 percent of the increased income from direct labor expenditures on a development project will be reflected in increased surplus food purchases. . . ."⁷

This increased demand for food and fiber can be largely satisfied through imports under P.L. 480, Title I programs and most of the local currency proceeds will go into financing the very development projects

⁶ The Draper Committee recommended: . . . (4) that available surplus agricultural commodities be used for economic development to the maximum extent consistent with the ability of the recipient countries to use them effectively. . . . " *Economic Assistance Programs and Administration*, Third Interim Report of the President's Committee to Study the U. S. Military Assistance Program, July 13, 1959.

⁷ *Uses of Agricultural Surpluses to Finance Economic Development in Under-developed Countries: A Pilot Study in India*; FAO Commodity Policy Studies No. 6, Rome, 1955. See also a review of this study by J. H. Richter; *J. Pol. Econ.*, 64:1, Feb. 1956.

that are the source of the additional demand. Experience indicates that surplus commodities, if their utilization is well planned in advance, can contribute as much as 10 percent of the cost of national economic development programs.

Since commodity aid can finance only part of the additional investment required, it is essential that this aid be in balance with the total investment or economic development program of the recipient country and be coordinated with traditional foreign exchange financing from other sources—domestic, foreign and international.

It is paramount to the success of any economic development program in densely populated, less-developed countries that basic industries be established which add directly to the national production of goods. Commercial markets for agricultural and other products tend to arise in nearly all countries in proportion to their degree of industrialization; i.e., in proportion to the percentage of the working force engaged in non-farm activities. Therefore, it is in the long-term interests of American agriculture to channel as much as possible of the surplus commodity aid and direct dollar assistance into basic industrial facilities. Since the country itself must finance 80 to 90 percent of its development, non-income-producing service projects can perhaps best be left for the country to finance with only such technical assistance from the U.S. as may be required.

It seems plausible that U.S. officials should be able to meet with Indian officials, for example, and plan at least a couple of years in advance the level of U.S. aid desirable in the Third 5-Year Plan, what part of it can be obtained from surplus commodities, and to which projects it will be allocated.

There is much to be learned in the use of surplus commodities in economic development before such planning can be fully effective. For this reason, the Foreign Agricultural Analysis Division of the U.S. Department of Agriculture is undertaking two series of research projects in India and other less-developed countries of the world. One will investigate various development projects to determine the amount of new employment and income coming from the project, the resulting increased demand for food which could be supplied by U.S. surplus agricultural commodities, and the extent that local currencies generated by the sale of surplus agricultural commodities could contribute to project financing. The other series of studies will investigate the long-term supply and demand positions of the countries for certain agricultural products and project import demand for these products for 1965 and 1975. These studies should supply us with some of the measures necessary for planning for effective utilization of our agricultural surpluses for economic development in the less-developed countries of the Far East and throughout the world.

I would like to conclude with a statement made by Secretary Benson: "... we want to look upon our agricultural abundance with all the problems it involves, not as a burden, but as a blessing. This blessing, if wisely used, can and will make a substantial contribution toward the solution of the great problems of our time arising from hunger, insecurity, and fear of war."³

³ Statement by Secretary of Agriculture, Ezra Taft Benson, before the Food for Peace Minister's Conference, U. S. Dept. Agr., Washington, D.C., May 5, 1959.

AGRICULTURAL DEVELOPMENT IN THE MIDDLE EAST AND AFRICA

PAUL E. JOHNSON

International Cooperation Administration

THE area with which we are here concerned stretches from the Kyber Pass, through which the armies of Alexander the Great passed in search of the riches of India, to the Bight of Benim on the Nigerian coast. We have in this area the oldest civilizations known to mankind, with written records going back six thousand years or more. We also have primitive tribal people without a written language who have never seen an American or a European.

The countries of the Middle East and North Africa have rich cultures developed through centuries of association with other civilizations; through much of the area a common language is spoken; and there is the great unifying force of Islam. In Africa south of the Sahara, on the other hand, the principal link with the outside world was, until the middle of the nineteenth century, the slave trade. In the tribal society of this area approximately seven hundred languages are spoken, but before the advent of the white man only three had achieved a written script.¹ While both Christianity and Islam have made millions of converts, and while Islam is still increasing steadily, more than a third of the people are still animist or pagan.

With the varying degrees of economic development, differences in geography and climate, and in ethnic, racial and religious background, there are, I believe, a number of basic common denominators which indicate the direction of future development. We find illiteracy, poverty, and short life spans, but a conscious striving for economic and social betterment.

In most of these countries nearly ninety percent of the people are farmers and, in my opinion, any marked increase in the gross national product in the next five to ten years, must come primarily from agricultural development. I shall try to show that from country to country the economic status and the problems of the average farmer are pretty much alike, and that a number of common guidelines can be applied in most situations.

Last April the agricultural officers from the International Cooperation Administration Missions in the Near East and South Asia met at a regional conference in Beirut. Each was asked to present a definition of a typical farm in the country which he represented. It was shown that while large

¹ John Scott, "Last Chance in Africa," *The Atlantic*, April 1959, p. 88.

holdings by absentee landlords are common, the average farm operator in the Middle East works only two or three acres of irrigated land. In Iran the typical farmer lives in a mud hut; his other assets include an iron-tipped wooden plow, one ox or donkey, a few chickens, four or five sheep or goats, a hoe, a rake, and a sickle.² He depends on credit—at exorbitant rates of interest—for all his production needs, and frequently for subsistence in the months preceding harvest. Crop yields are low due to poor seed, inadequate and untimely tillage, and low soil fertility. Because of lack of knowledge of sound water practices, the irrigated land frequently becomes either waterlogged or excessively alkaline.

Whether we look at Jordan, Iraq, or Afghanistan, the picture is much the same. It is still the wooden plow drawn by oxen, and exorbitant interest rates. Corn and cotton, as well as wheat are sown broadcast. There are few trees. Cattle dung mixed with straw is used for fuel. Diets, by our nutritional standards, are woefully inadequate. Due to low fertility and shortage of water for irrigation, half of the arable land may lie fallow each year. There is no sanitary milk supply, no medical services except the local midwife. Drinking water is polluted and dysentery is almost universal.

In Africa south of the Sahara conditions are much the same: poor health, illiteracy, and low income. Farming techniques are in most cases more primitive than in the Middle East. Generally, there is no freehold ownership. While an individual may have the use of a particular piece of land, his rights are limited by other rights held by members of his clan or tribe.³

An ICA consultant who made a survey of the agriculture of Liberia only a few months ago reports that the typical farmer may live in a village of mud huts accessible only by a trail. He has neither a work animal nor a wheeled vehicle. Farm produce and other freight is moved as a head load. He works the land with a crude hoe. While rainfall averages from eighty to one hundred inches annually, erosion is not yet a serious problem. With the farming practices followed, the vegetative cover is never completely destroyed. Over the years patches have been cleared in virgin rain forest mainly for rice; until recently they were allowed to go back to bush and trees for ten or fifteen years.

The question is: How can we help accelerate agricultural development under these conditions? There is the story about the boy and the old man looking at the large packing box on the railroad platform, both wondering how to get it into the wagon. The boy asks, "Do you think we can lift it?"

² Near East and South Asia Regional Conference of Food and Agricultural Officers, International Cooperation Administration, Beirut, Lebanon, April, 1959.

³ T. R. Batten, *Problems of African Development, Part II Government and People*, Oxford U. Press, 1954. pp. 24-25.

The old man replies, "I reckon so, if we can just find a place to grab hold."

Where we grab hold will vary from area to area, depending upon local conditions and the degree of social and economic development. I do not agree with Dr. Bredo that industrialization is the dynamic element in the economy necessary for change. In my opinion the dynamic momentum he seeks can best be initiated by simple changes on the farms described above. While the point of departure will vary, I believe that, in most areas, the following guidelines can be applied.

1. We should start with practices that are simple, easy to demonstrate, and relatively easy to carry out with available tools and equipment.

2. The practice should cost the farmer nothing but his labor, or at most a small cash outlay.

3. Most of the farmers operate so close to the margin that they cannot afford to risk failure. Therefore, the value of the practice must be demonstrated beyond reasonable doubt.

4. Once a new practice is introduced the supplies and equipment to continue it must be available year after year. There is no point in showing a farmer the value of a fertilizer or insecticide that cannot be obtained locally.

5. We should encourage changes which can be readily adapted to the present agricultural pattern. Our typical farmer isn't ready for a tractor.

6. The proposal must be socially and culturally acceptable. Changes in the purdah system can wait.

Practices which might fit into a program of this kind are planting corn, grain sorghums, and other crops in rows instead of broadcast; better seed selection; weed control; and planting at the proper time. (One demonstration in Asia indicated that wheat yields might be increased 25 percent if farmers would step up the seeding date by ten days.) Also we might include insect, disease, and rodent control; and improved irrigation practices.

Most of these practices involve little or no cash outlay. If their value can be demonstrated the chances of general acceptance is good. While these practices are being established, research and testing can prepare the way for the introduction of new plant material, better breeds of livestock, improved farm equipment, a supervised credit program, etc.

In some of the countries in this area, ICA agricultural technicians have been working for five years or more. It is fair, I think, to ask what has been accomplished.

Brown Swiss sires were brought into Iran about eight years ago for use on native cows. Over 90,000 inseminations have been made and there are now 15,000 milking crossbreeds. Good native cows produce an average of 900 liters of milk per year, while the crosses average 2,200 liters. The annual increase in milk income is estimated at \$1,800,000, more than the

entire United States contribution to the livestock program in Iran since its inception in 1951.

ICA has had a contract for a number of years with the United States Department of Agriculture for work in insect control. The program includes the training of pilots for locust control from the air. Last year a serious locust invasion threatened the Middle East. About 100 swarms, some thirty miles in length, were reported in Iraq. In Iran as many as a million hectares were infested at one time or another. Approximately thirty airplanes went to work with ground crews in a full-scale eradication campaign and brought the invasion under control. This story would probably have made the headlines if it had not been for the insect control program.

At an experiment station near Peshawar one of our technicians started testing imported varieties of hybrid corn approximately five years ago. Since Peshawar has a sub-tropical climate, the first seed was brought in from Texas and Mississippi. The results were only fair. Now seed from the Corn Belt is producing spectacular yields. With the added help of row planting and weed control, there are possibilities of doubling and even quadrupling present yields.

In many of these countries assistance has been provided for agricultural colleges. At Karaj College in Iran the scope of the curriculum has been substantially enlarged, physical facilities improved, and in four years (1954-58) the enrollment doubled. Three years ago a college of agriculture was started in Afganistan. In many countries vocational agricultural schools have been assisted. Courses in general agriculture have been introduced in elementary and secondary schools, and teachers have received special training in agricultural subjects.

In most of these countries extension programs have been started, generally fashioned after the Federal-State-County system in the United States. Local technicians are being trained as extension agents to bring scientific knowledge and technical help to the village. Generally only a few college-trained men are available for extension work. The shortage at high school level is almost as acute. Often young men with only three to six years of elementary education are upgraded in technical knowledge through short courses and used as extension workers at the village level.

It is difficult to measure quantitatively the contribution made to agricultural development by extension services, agricultural schools and other institutions. However, studies now being made by the United States Department of Agriculture indicate that in spite of accelerated population growth, the per capita output of agriculture is increasing in most Middle Eastern countries.

As we have shown, most farmers in this area are handicapped because of their inability to read and write and because of low vitality due to mal-

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nutrition and disease. In addition to assistance provided for local schools and colleges, hundreds of students are being sent to the United States and other countries for training not yet available at home. Public health programs have already reduced the death rate, and shipments of surplus United States farm produce are helping solve the problem of malnutrition until recipient nations can supply their own needs.

I agree with Dr. Bredo that agricultural development can be served in many areas by local production of such basic farm needs as insecticides, fertilizer, hand tools, and plows. Small industries in the villages can provide employment during slack work periods. Industrialization when it comes—and timing is extremely important—should be carefully integrated with agriculture. It is essential that there is an assured source of raw material.

In Afghanistan there is a modern, well-equipped sugar mill. It is in a cane-producing area, but when I saw it two years ago it was not in operation. Yields in the area are low. The farmer needs every cent he can get from the cane, regardless of the work involved, so, with crude equipment, he processes sugar for his own needs and sells a small surplus on the local bazaar. With insect control and improved varieties, enough sugar cane may eventually be grown to operate the mill at full capacity. In the meantime the mill, which represents a large investment of local capital, is standing idle. One of our technicians saw a similar fiasco in Nigeria last year: a canning factory with nothing to can.

While low agricultural output in this area will generally explain the low gross national product, the close association of agriculture and low incomes should not be taken as evidence of cause and effect. Australia, New Zealand, and Denmark, which are preponderantly agricultural, enjoy some of the world's highest living standards.⁴

In conclusion, it should be noted that the countries of the Middle East and Africa have embarked upon ambitious programs of economic and social development. Many of the projects to which the governments are committed, such as public works, village schools, hospitals and other medical services are extremely worthy and basic to national progress, but by their very nature many of them involve large expenditures on which an economic return cannot be expected for a number of years. As Dr. Bredo has indicated, if economic development programs are to be supported, there must be an increase in foreign exchange earnings, as well as an increase in national income to provide a broader tax base. In countries so predominantly agricultural, these increases, in my opinion, can best be obtained in the years immediately ahead by augmenting the output of the farms.

⁴Norman S. Buchanan and Howard S. Ellis, *Approaches to Economic Development*, The Twentieth Century Fund, 1955.

AGRICULTURAL DEVELOPMENT IN LATIN AMERICA

KENNETH WERNIMONT

The Rockefeller Foundation

EVEN in the jet and rocket age, agricultural development in Latin America is a large topic for a fifteen-minute discussion. A Boeing 707 might be expected to take at least twelve hours for the 6,000 mile trip from Tiajuana, Mexico, to Cape Horn. The passengers would see little en route but a haze of desert and jungle with no time for more than the roughest outlines of land and water features below. Human influences upon the natural terrain would be obscured and political boundaries totally insignificant.

Fortunately there is a substantial body of knowledge about this land mass, the collection and analysis of which has been greatly accelerated during the last twenty years. The search for this information has been stimulated by the pressures of war and the clamoring problems which are emphasized by explosive population growth and shrinking frontiers. The miracles of modern transportation and communication both multiply the need for knowledge about the countries of Latin America and facilitate the processes of research.

Statistical analysis of the agricultural situation is still based on fragmentary information, much of it the result of not very precise guessing on the part of experts and, occasionally, biased politicians. Nevertheless, the broad outlines are reliable and the dynamics of change are everywhere unmistakable. Of great significance is the fact that statistics and their interpretation have now become a concern of responsible leaders in each of the countries and not solely a concern of the technical assistance agencies of the United States, the Organization of American States, or the Food and Agriculture Organization of the United Nations.

The total area of the twenty Latin American republics, plus the Guianas and Surinam, is about two and two-thirds the size of the United States. Recent studies conclude that less than 5 per cent is cultivated. Another 20 per cent is in pasture lands; 45 to 50 per cent is estimated to be in forests; and one-fourth to one-third of the total is economically unproductive.

Climatic and soil conditions are extremely varied, ranging from temperate to tropical. The tropics in particular have been favorable to the specialty crops in the past, with plantation sugar, coffee, cacao and rubber playing significant roles in the rise and fall of colonial empires. Food crops have been grown on a primitive and subsistence basis which still prevails in parts of most of the countries, as typified by the "fire agriculture" of the Amazon or the crazy-quilt pattern of minifundia grain and potatoes in the high Andes.

There are few richly productive regions at the present time which would compare with the North American corn belt. On the other hand, there are extensive deserts, plateaus and tropical jungles which could be opened up to food production with machinery, appropriate water utilization and the application of modern plant and animal science. Some say the Latin Americans are using less than 40 per cent of their potential food growing land. Whatever the figure, it is certain that Latin Americans have several times more cultivable land per capita than the Asians and perhaps twice as much as the Europeans.

This favorable relation of people to land is an advantage which diminishes with time. Recent data place the population of Latin America at about the 180 million mark with annual increases at the rate of $2\frac{1}{2}$ to 3 per cent. The percentage of population directly engaged in agriculture is high but it is decreasing. It ranges from 25 per cent in Argentina to 73 per cent in Nicaragua. The rate of population growth in cities far exceeds that in rural areas. Dr. T. Lynn Smith has recently examined the data for Mexico, as an example, and finds that the population in urban districts (centers of 25,000 or more) is increasing three times as fast as in rural districts.

No complete relief is in sight for poverty and hunger in the Andean highlands, or for the drab existence of the parched lands of northeast Brazil, or even for the day laborer in Argentina whose cost of living goes up "by the elevator" while his wage increases are geared "to the stairs." Yet the remarkable thing is not how backward Latin American agriculture is at midtwentieth century but how it has grown in productive capacity in the last twenty years. Almost within that time a subsistence occupation which once dominated the national economies of the twenty republics has begun to mature into a strong arm which joins mining, manufacturing and other endeavors in providing for sound expansion and a more effective employment of a growing population.

We know today, as the result of research at a dozen well-organized agricultural experiment stations scattered from Chapingo near Mexico City to Castelar a few miles from Buenos Aires, that the yields of basic food crops such as corn, wheat and beans can equal average yields in the United States. Good seed, fertilizers, control of pests and diseases, and proper tillage practices can change corn yields in Mexico from 10 bushels an acre to 50, or wheat in Colombia from 5 to 6 bushels an acre to 25, and it can be done on a large scale. We know that land is available for expansion, either by direct exploitation or through reclamation. Thus the race between food and population may depend as much on the economist as upon the biologist during the next twenty years.

There are a whole series of key problems to engage the attention of the economist, the most fundamental of which is perhaps farm management.

Relatively simple input-output factors on individual farm units have been given comparatively little study in Latin America. There are few Latin Americans who have been trained in farm management economics and so are prepared for manipulating the resources of land, people and scientific knowledge to produce more and better food and fiber. More are needed, not only for strictly managerial functions but to broaden the sampling of individual farm data so that there may be better understanding, from country to country, of the true nature of the "farm problem."

The land economist is another who has a fundamental role to play. What are the optimum sizes of farms in the Valley of Mexico, the irrigated districts in Sonora, the pampas of Argentina, or the "terra roxa" of the State of São Paulo? If and when they can be determined, what are the institutional measures to be followed in reaching optimum size? Should farms be small or should the plantation system be followed? Does one increase production by opening up new lands with all the pain and hardships incident to resettlement, or is the breaking up of huge estates the best way to improve the efficiency of land use?

The *ejido* system in Mexico is now old enough to begin to reach a point of some stabilization. With about half of the farm land in *ejidal* ownership, there is improved management within the system, accompanied by increased facilities for credit and cooperative marketing. Outside the system, encouragement is being given to small farm ownership through the strengthening of land titles.

In Cuba, land reform is a newly implemented political determination which may disregard not only property rights but the economics of production before it is through. In other countries, the problem of large and sometimes marginally operated haciendas is a conspicuous issue which will be solved either by evolution or revolution within this generation. One of these countries is Peru, where fortunately the large landowners have been farsighted enough to establish a governmental commission to carry out serious studies of land reform experience in Mexico, Italy and other countries as a basis for a program of action at home.

Agricultural marketing is another branch of economics which urgently needs attention in Latin America. This is a field, like land reform, which is highly sensitive to politics. It is one for which indigenous talents must therefore be developed. There can be little doubt, however, that better facilities for transport, storage, processing and wholesale and retail handling are urgently needed. In this country, it was possible for these facilities to grow up with the opening of new frontiers. In Latin America, the exploding urban population cannot wait. Sound improvement of agricultural marketing will depend heavily on the speed and worth of marketing analysis and planning.

Closely associated with market organization is the matter of farm

prices. Several Latin American countries have undertaken some form of price support program to induce production of food crops, or some type of export control to endeavor to stabilize prices of commercial export crops. Rather than having such measures originate as copies of legislation in other countries or in response to individual pressure groups, there is need for sound studies and these will require some sequence of time to be of value.

Along with prices comes credit. Interest rates are traditionally high in Latin America. Even this factor does not attract adequate credit for either the production or marketing functions. Governments have moved forward since the war with various types of credit banks. Private banks have, in some countries and to some extent, gotten into the crop and farm loan business. The available facilities are far from adequate, however, especially if needs for opening up new lands, purchase of new machinery and other modernizing gestures are to be taken into account. Where to obtain capital for loans, how best to make them available to farmers and how to hold both risks and interest rates down are all urgent problems for study.

Once strongly oriented toward export crops, Latin American agriculture has been reviewing and to some extent revising its position in foreign trade. Here is an area of study, not only for the market economist who tries to facilitate the flow of commodities, but for the national policy analyst whose task it must be to help determine whether it pays to export coffee or cotton and import wheat, rice, fats or sugar.

The national policy analyst also faces such choices as whether to concentrate capital investments in factory development or whether to syphon off "X" quantity of pesos, soles or cruzeiros for irrigation and other major projects in agricultural development. These serious choices are further complicated by the fact that projects relating to agriculture are not held in very high esteem in some corners of Latin America, owing in part to the association with export crops and colonialism and in part to the status of the "man with the hoe" in the social order.

The fascination of industrial development as a way out of the "farm problem" has been tempered by experience. The surplus of inefficiently utilized labor from rural areas can be attracted to the cities. This increases the industrial labor supply but it also multiplies the problem of providing adequate food. City dwellers can no longer have a patch of corn or a grove of bananas on which to subsist. All their food has to be transported, stored and placed on sale in central markets. Thus the goal of self-sufficiency in basic foodstuffs, at least on a regional basis, may be more fundamental to the long-term industrial progress of Latin America than new automatic machines for factories, or Cadillacs for their owners.

In the time allotted, less attention has been given to what agriculture in

Latin America is than to what the tools and techniques of the agricultural economist might contribute to its development. Here the question of trained manpower is of key importance. Probably the agricultural economics departments in colleges around this country will see a rising enrollment of Latin Americans. At least that is to be hoped. We have much to teach and to demonstrate, even though the economics of an upstate New York dairy farm may not operate according to all the same rules which apply to a dairy farm in Uruguay, nor do corn belt phenomena necessarily fit the situation in Central America.

Looking ahead for a few years, it is of the greatest importance that strong centers of training and research be established in Latin America itself where theories and techniques can be especially and sensitively tailored to local situations. There are some bright spots already. The University of Chicago team at the Catholic University of Chile has made a significant beginning. Economists in a dozen institutions from Argentina to Mexico contribute to the body of knowledge. Organizations like the Bank of Mexico are not only helping to train economists but they have learned how to use them profitably. The FAO and the Inter-American Institute of Agricultural Sciences have made important contributions in training. Intergovernmental discussions of the "common market" and recent inter-American economic conferences tend to call attention to the urgency for training more economists. The agricultural economist will be called upon for substantial contributions all the way along the line from individual farm management to national planning.

There is a story commonly told in north Brazil about a *caboclo* who was asked by the king whether his land would grow corn. The *caboclo* replied negatively, whereupon the king inquired whether he had ever planted corn. "No," said the *caboclo*, "but of course it would grow if you planted it." Our Latin American neighbors need to do more planting and we must continue to be as sympathetic and helpful as possible in bringing the crop to fruition.

POSTGRADUATE INSTRUCTION FOR FOREIGN STUDENTS

Chairman: Karl Brandt, Stanford University

TRAINING STUDENTS OF LESS DEVELOPED COUNTRIES IN AGRICULTURAL ECONOMICS

A. B. LEWIS

The Council on Economic and Cultural Affairs, Inc.

IN THE history of the world people have turned their faces toward the lamp of learning wherever its flame might be burning brightest at the time. India, Greece, China, Rome, Egypt, England, France and Germany are among the countries which have at one time or another during the past 2500 years been gathering places for the world's seekers of new knowledge and new ideas; and now this country has become a concourse for scholars. While this is in one way a new manifestation of an old fact, it is in another way a new phenomenon, because the contrast between conditions in this new center of learning and those in the places from which many of the foreign scholars come is wider than it ever was before, nor are the differences to be listed only under the headings of climate and soil. In the last 400 years there has arisen a new human era, for reasons which must be found within the mind and soul of humanity itself. What is new in the landscape, the capital equipment and the methods of producing and utilizing goods which are characteristic of this new era, are superficial evidences of a deeper change. It is significant that nowhere are the superficials and the fundamentals of the new era more highly developed or more firmly established than they are in this part of this hemisphere.

In these circumstances the fruits of a great change glitter on all the branches of life here, and people come from far and wide to carry them away. What many fail to realize is that these are all evanescent, frail, and perishable, in the absence of their roots, and that scholars must carry away and plant in their own countries the seeds and the roots of this new era, if they expect permanent and useful results. Can we not as agricultural economists help to show them what to look for and how to find it?

The Council on Economic and Cultural Affairs, Inc., is intensely interested in the answer to this question, since one of our goals is the strengthening of professional work in agricultural economics in Asia and one of our methods is to finance the training of qualified Asian graduate students, mainly but not solely in this country. We are frankly not satisfied with the results which this training generally achieves, and have been developing methods of improving these results. We have, for example,

selected with great care the agricultural economists who were to receive Council fellowships. We have given advice and aid to fellows in the selection of universities. We have advised university professors on the special needs of our fellows, and have tried to keep in touch with both the fellows and their teachers. We have enlisted the aid of the Institute of International Education in the administration of our fellowships, and have tried to make our fellows feel personally at home and financially secure, without, however, incurring undue costs. Through a modest program of grants for research, we have tried to help them apply at home what they have learned here.

In addition, we have sponsored two special summer school courses for Asian graduate students of agricultural economics, during which the difficulties of adapting American training to the farm economic problems of the Orient were directly faced and efforts were made to repair some of the basic deficiencies of this training from the viewpoint of the needs of Asian students. One of these courses was given by Cornell University in 1957 and the other by Ohio State University in 1958. Both were attended by students from a number of Asian countries studying at a number of American universities. Immediately following the first of these courses, during which the special needs of the students and the short-comings of American university programs in meeting these needs became very apparent to us all, the Council undertook a special study of the problem as it affects the training of agricultural economics students from Asia. This study, which was made by Dr. Clifton R. Wharton, Jr., of the Council staff, has just been published.¹

Dr. Wharton's report can be reviewed only briefly here, but it should be read by all who are concerned with the training of agricultural economists from any part of the technically less advanced world. It is based on interviews with Asian students of agricultural economics and with faculty members at fourteen American universities, and on interviews with prospective students, returned students, and senior economists in six Asian countries. Described in this report are the professional problems of the students as they grope for the right university, try to visualize in advance the cost and character of study in an alien civilization, struggle with courses of study given in a foreign language and generally based on unfamiliar agricultural conditions and enterprises, and attempt later to reestablish themselves at home and apply there the new ideas and methods which they have learned.

The doubts and difficulties of their professors are also set forth, often in their own words, as they react to the social outlook of the students,

¹ *The U. S. Graduate Training of Asian Agricultural Economists*, by Clifton R. Wharton, Jr. Published by The Council on Economic and Cultural Affairs, Inc., 1959.

puzzle over the significance of the language barrier, observe the readiness of the students to memorize information and their reluctance or inability to solve real problems, struggle over the question of the "underdeveloped M.S. and the Oriental Ph.D.," and face the need of assigning dissertations that represent a real contribution to knowledge and not merely a formal exercise in compilation.

Dr. Wharton's recommendations are based on his material, and should be given most thoughtful consideration. Universities should improve their methods of selecting Asian students; recognize the difficult problems which Asian students encounter in initiating their studies here and help them solve such problems; add an international dimension to their agricultural economics curriculum; experiment with methods of making dissertations useful and meaningful to the students and their countries; reexamine their standards for advanced degrees as applied to Asian students; help the students solve the problem of establishing themselves as agricultural economists in their home countries after their return; and confer with each other more often, as we are doing now, on common problems in the development of these students.

The findings of Dr. Wharton's study and the observations of others on the training of students from the Orient will apply with little or no change to the education of students from Latin America, and probably from all parts of the technically less advanced world. Changes in our training programs and procedures which would benefit students from one less advanced region should be of equal benefit to all.

It is, of course, not easy to change university procedures, curricula, the viewpoint and content of courses, and methods of instruction to meet the needs of a more cosmopolitan student body. Specific changes should vary from university to university, depending on present practice and local conditions. What I should like to propose here is that in forming a judgment of our success in meeting the needs of agricultural economics students from technically less advanced countries, and in evaluating from time to time the changes we make, we ask ourselves the following main questions, among others:²

Do the students learn to think?

Do they learn English?

Do they obtain help in studying the problems of their own nations?

Do they learn to respect their own common people?

Do they learn to be practical?

² A fuller discussion of these questions will be found in *Thoughts on the American Training of Graduate Students of Agricultural Economics from Less-Developed Countries*, by A. B. Lewis. Published as a Council Paper by the Council on Economic and Cultural Affairs, Inc., 1959.

Do they learn administration?

Do they learn why they had to travel hundreds or thousands of miles to find the education which they wanted?

Do they learn to think? The education methods of most schools in the technically less advanced countries are highly authoritarian, all the way from the kindergarten through the university. College students are taught facts, precepts, and formulas, almost entirely by the lecture method, and tests require reproducing what was given out. Questions are discouraged, outside reading and reporting is rare, field trips are very rare, and originality in the solution of problems is not stressed. The student does not dare to ask questions and the professor does not encourage them.

In these circumstances, in the sense that thought seeks the relation of cause to effect and recommends the manipulation of causes to produce effects, brilliant minds may lose the power of thought. The memory, however, may be remarkably developed by this system. Students may therefore be able to pass with distinction any examination which does not require the analysis of a new situation. Graduate students from technically less advanced countries, having passed many seemingly difficult courses, and having been allowed to write a descriptive thesis based on secondary materials, may—many do—receive an American M.S. or Ph.D. degree and return home, without having learned to think; that is, without having learned to solve any problem.

Probably the only effective method of teaching such a student to think is to take him through the process of thought in the solution of a real farm economic problem. The first step would be to help him identify problems. The second step may be to convince him that data are needed for solving the chosen problem, because his first reaction may be to seek a standard solution among memorized precepts.

The third step will be to teach the student to obtain data that are amenable to the analysis of causes and effects. His own impulse will almost invariably be to gather a mass of descriptive data, much of which cannot be inter-related in any causal sequence. It is, of course, basic to the design of the data-collecting process that the student must have some prior notions of probable or possible cause-and-effect relationships, or hypotheses, which touch his problem. Here, as well as in the identification of problems, the lack of practical personal experience in agriculture on the part of the usual student will be a severe handicap.

The fourth step will be to teach the student to analyze the data. Here the student will be prepared, if allowed, to leave his mind outside, like shoes on the steps of the temple, and commit the data to whatever mathematical mill is in highest fashion at the moment, but the more abstruse and abstract the better. In cases where either plain arithmetic or matrix

algebra would do, he will choose the matrix algebra on principle.

For the purpose of teaching a student to think, those simpler methods of analyzing data, which do not convert them to abstractions too soon, but which force the student to philosophize on pumpkins as pumpkins and land as the earth and to come to conclusions on relationships expressed in original kinds and units, are superior. Only by learning to think in full recognition of the characteristics of real things can a student master the intricacies of ordinary arithmetic as they affect the calculations of averages, dispersions, tables of relationships, and graphs, and develop a sense of what is sensible and valid. He should make a step-by-step analysis of his data, proceeding from the details toward the whole.

The graduate student from a technically less advanced country may have to be taught, as a fifth step, that his conclusions should be based on his data. The Aristotelian notion that conclusions are derived by the application of logic to systematic observations of the real world is often practically unknown and unaccepted in his country. The student may feel that the exercise of collecting and analyzing data is a necessary part of one's initiation as a Ph.D., but should not be allowed to disturb one's fundamental and accepted precepts, such as the following: all landlords are bad and tenancy is the root of evil; all middlemen are parasites (especially if of a different nationality); joining farm cooperatives should be made compulsory; farms should be run as cooperatives; irrigation will immediately modernize any country; moneylenders should be abolished; farmers should not be allowed to buy or sell land; every country should produce all its food and fiber and export a surplus; and all price fluctuations should be suppressed by edict.

Finally, there is the matter of recommendations. The student may not be accustomed to the idea that recommendations may be made by students. On the other hand, he may feel that it is beneath him to make recommendations for farmers and their wives, since the scholar, in his society, has traditionally had the function of advising the ruler on how to treat the people—not of advising the people, as with us, on how to cope with their environment including, sometimes, the government. The farmers, like squirrels, were and still are supposed to proceed by perverse instincts inherent in themselves, such as can with difficulty be corrected by interference from outside and above.

The foregoing discussion fortunately does not apply to all students from the technically less advanced nations. However, these nations have remained technically less advanced for reasons that are closely related to what is implied here concerning the mental set of many of their graduate students.

*Do they learn English?*² This question is closely related to the question

of whether or not the graduate student learns to think. This is not to say that people who do not know English cannot think; yet if a graduate student who has had some exposure to English for a number of years still cannot express himself clearly in this tongue, suspicion is justified that his ideas would not be found clear and definite even in his own language.

All our foreign graduate students of agricultural economics should be able to express themselves clearly and grammatically in English before they leave us. A reason for this recommendation, other than our need to be sure that they understand what they write and say, is that if an agricultural economist can write and speak English clearly, he can communicate his ideas to colleagues in other countries much more effectively than if he speaks and writes English poorly.

Some of our colleges are more successful than others in equipping foreign students with a respectable command of English. First, it is necessary to recognize the importance of clear expression for ourselves, as not all of us do. We must also realize that the need of the foreign student for a real command of English may be even greater than our own, since this may convey with it a new and valuable habit of making clear distinctions in thought, as well as a key to international knowledge, recognition, and cooperation.

In the writing of reports and theses, students should learn the principles of orderly technical composition. They should learn how to prepare reports for a literate farmer or a legislator to read, as well as those which are intended only to be read by their professional colleagues.

Do they obtain help in studying the problems of their own nations? In agricultural economics today, how relevant to conditions in technically less advanced countries are American studies of milk marketing orders, economy of use of machinery and labor on our specialized, highly efficient farms, methods of packaging vegetables and fruit to attract the world's wealthiest and busiest housewives, and the like?

In agricultural credit, cooperation, and marketing, the technically less advanced countries face problems and are infected with ideas and opinions which have not been current here for thirty years, at least. Issues which are generally ignored in our courses of instruction, such as cooperative farming, the abolition of feudal land-holding systems, and the possible operation by the government of the whole apparatus of food distribution are the subjects of planning-board decisions in various countries today. If such issues are not dealt with in courses attended by our foreign students, they will go home filled with the latest information on our problems but still probably in possession of all the basic misconceptions concerning their own problems with which so many have arrived so well equipped.

It is of value to the foreign student to participate in classes with Ameri-

can students. It is also of value to the American students that the foreign student be there, and that the agricultural economic problems of his country should be discussed in the class. Our own students will learn more about principles in this way than they can possibly learn from their application in the narrow range of human experience which is available in the United States.

The key to success in broadening and deepening the content of our agricultural economics courses is that more American agricultural economists should work and study on temporary assignments in the technically less advanced countries.

Do they learn to respect their own common people? This question implies that many if not most of the graduate students of agricultural economics who come here from technically less advanced countries do not now hold their own peasant farmers in respect, and this is indeed the case. The great majority of the students of such countries—even in colleges of agriculture—are not the sons of farmers, but of bankers, merchants, large land-holders, professional men, and officials. Typical students from technically less advanced countries are convinced that their own common working people, including peasants, are stupid, lazy, and untrustworthy. Many of them will not listen to farmers and have no common ground of understanding with them.

It is a corollary of this that many agricultural economics graduate students from technically less advanced countries have a strong faith in coercion and in central and superior direction as a means of achieving national agricultural goals. They cannot conceive national goals as being set with the aid of farmers but only as being set by government. They are inclined to leave out of account in their recommendations to government the factors which motivate farmers as people, as well as those natural facts which limit their productivity in practice.

One method of changing the habitual attitude of agricultural economists of the technically less advanced nations toward their own farmers is to make them familiar with American farmers and how they work. Chinese students who lived and worked for a few weeks on farms in Iowa and elsewhere were amazed to learn how hard our farmers worked, how long hours they kept, and how in spite of this they had an active social, political, and educational life and helped run their communities.

Through acquaintance with farmers the students may learn the power of free motivation in the operation and advancement of an economy. If we can succeed in teaching this we shall have helped lift from the backs of the toiling farmers of these lands a great potential burden of regulation and repression, such as other-worldly economists are more and more eager to fasten upon the peasants in the hope of stimulating material progress.

Do they learn to be practical? It is easy to appreciate, from the discussion of previous questions, that typical agricultural economics graduate students from the technically less advanced countries do not have a practical viewpoint toward agricultural problems.

In many instances, American teachers of foreign students have not helped them overcome this handicap, but have assigned their charges to write theses based on the compilation of secondary data in the library, on some such broad topic as "Agricultural Credit in _____." It has been quite possible for the students to present a thesis on such a topic without any real knowledge of or first-hand experience with any of the realities that are concerned, and to base their conclusions on clichés of doubtful validity and on false assumptions, without them or their advisors being aware of it. Wherever suitable supervision can be provided, a student's thesis should require him to make a field study of a real problem in his own country.

Assigning foreign students as assistants in field studies of farm economics in this country would also help them to achieve a practical viewpoint, but professors have often been reluctant to assign them to such work, fearing that their unfamiliarity with the lingo of farming, and naïveté in all things rural, would make them a burden in the field. Many American farmers, however, if forewarned, would probably be glad to help in the education of the foreign students, and would be quite capable of overlooking their inexperience. Furthermore, the majority of the foreign students are highly intelligent and can learn to be more practical. We ought to exert the special effort that is required to enable them to become so, if we accept them at all.

Do they learn administration? The need of agricultural economics graduate students from technically less advanced nations for instruction in administrative principles and methods is distinctly different from that of our own students. Since most of them are not farmers' sons they will have had little or no experience with agricultural agencies. Furthermore, when a young agricultural economist joins a college or the government, he will often find that his agency is so organized as to make it difficult for a well-trained, conscientious staff member to accomplish anything or be happy. For this reason, many returned graduate students have given up any attempt to do what they were trained for, and have turned to some other kind of occupation.

In many countries, nevertheless, a rising demand for agricultural economists for new government bureaus has placed comparatively inexperienced men in comparatively high positions. Some of the agricultural economists of technically less advanced countries who are in our classes

today may therefore find themselves in positions of administrative leadership surprisingly soon.

In these circumstances, graduate students of agricultural economics who come here from the technically less advanced countries need to become personally familiar with the administrative principles and practices which are characteristic of effective agricultural agencies. If the line of least resistance is followed in planning their activities here, however, many of them will know as little concerning such matters when they leave as when they arrived.

What we should lead the foreign student to understand include the following relationships: the practical partnership which exists between agricultural extension workers and farmers, and the means whereby farmers help in shaping extension programs; the relationship between farmers and the agricultural experiment stations, and how farm problems become the subjects of research; the administration of research, teaching, and extension in our colleges; the relation of the state legislature to the land-grant college, and the function of the board of trustees; the administration of agricultural regulations by the state and Federal departments of agriculture; the rights and responsibilities of the local governments of rural counties, towns or townships, and villages; the management of farmers' cooperatives; and the relation of cooperatives to the government and to corporate and individual businesses.

Do they learn why they had to travel hundreds or thousands of miles to find the education which they wanted? Between graduate students of agricultural economics from the technically less advanced nations and most American ones, there is a radical difference in point of view toward the subject and their career in it. While American students readily appreciate the importance of individual farmers improving the management of their resources and increasing their family incomes, the typical foreign student is more interested in the broad problem of national economic advancement than in any other. He wants to know what decisions and acts of government agencies will quickly bring about the modernization of his country.

In these circumstances, the student should learn the sources of the economic advancement of the people among whom he has come to study. He should learn the history and the economic value of universal popular education; of free and responsible government at all levels, particularly of rural minor civil divisions; and of free, non-state-connected religion which stresses love and trust between people.

The foreign student, in other words, should be assisted to appreciate the basic philosophical assets on which the economic advancement of our

people is based. Among these I would list the three main ones as the following: inheritance from the ancient Greek philosophers of the objective method of analyzing causes and effects in the natural and social world; inheritance from the ancient Hebrews of the conception of man as the highest of God's creatures, and of the rest of Creation as subject to his dominion; and dissemination among the common people of the teachings of the New Testament, by virtue of the great revolution of the Reformation. Students who come here should learn why this is an inverted society, in which, in contrast to the situation in most of their own societies, leaders are servants and the people rule.

For agricultural economists thus to invade the fields of history, philosophy, and even religion may be thought brash. Historically speaking, however, and as one takes a broad look at the world, the sparks and springs which set off the unexampled advancement of countries such as ours are more important as economic factors than any others. Unless we include these in our teaching, we shall have contributed little that will send our foreign students home more enlightened than when they came concerning the things that matter most to them and their people.

We may hope that an understanding of these things will provide our foreign students with a new perspective on their own national problems, that they will better appreciate the importance of the individual citizen, including the farmer, as the foundation of the state, and will be more contented to find solutions of problems of farm management, marketing and the like that will assist him in his daily decisions. We may hope that they will better resist tyrannical and utopian impulses, and will acquire confidence in the economic value of freedom and in the worthiness of common people to be trusted.

Again, this particular part of our educational assignment can best be borne by teachers who have had the experience of trying to get something accomplished in the technically less advanced countries from which these graduate students come. The foreign students themselves are deeply interested in these matters, and are quite capable of considering them as economists.

UNIVERSITY TRAINING IN AGRICULTURAL ECONOMICS FOR FOREIGN STUDENTS

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Introduction

THE increased role of the United States in the conduct of international affairs leaves few of our citizens untouched. The new position of our nation offers more challenges, more responsibilities and more opportunities to some, however, than to others. To the staff members of the American colleges and universities, and particularly to the workers engaged in the social sciences, the challenges loom large, indeed. But as we, as social scientists, work at our profession, we do so with a frustration brought on by the chaotic state of world affairs and the fact that our social organization and development lags scores of years behind our scientific and technological advances. In spite of these somewhat unsettling vexations—or perhaps, more accurately, in response to them—the American colleges and universities have committed themselves and have often provided the leadership in improving international relations with countries throughout the world, in marshalling human and technical resources to bear on socioeconomic problems in less developed nations, and in stimulating educational programs designed to upgrade man's relationship with man. This is being done in part through educating an increasing number of foreign students in our colleges and universities.

I propose to spend a few minutes trying to set in perspective some of the considerations that concern us most in the management of a graduate program for foreign students in the area of agricultural economics. With the added number of students who come for training each year under their own auspices and under the auspices of a multiplicity of agencies, the problems have become further complexing and more intricate. To facilitate the discussion I further propose to group the problems, somewhat arbitrarily, to include (1) the selection of foreign students; (2) the orientation of foreign students to the American scene; (3) the nature of the graduate program; (4) special treatment of foreign students; and (5) the follow-up on the foreign students upon whom graduate degrees have been conferred.

The order of the discussion is dictated, in large part, by the sequential nature in which the foreign student's and the educational institution's abilities and capabilities are challenged to work out satisfactory adjust-

* The author is indebted to Selmer A. Engene, Harald R. Jensen, O. B. Jesness, Luther J. Pickrel and Willard W. Cochrane for helpful suggestions and criticisms in preparing this paper.

ments or to arrive at satisfactory decisions. There is no attempt to assign any particular weight or import to any particular area under consideration. In thinking of "the foreign graduate student" I have intuitively placed emphasis on the problems of the students coming to our institutions from the less advanced or less economically developed countries of the world, although country of origin certainly is not a universal basis of classification for success among graduate students. Furthermore, the potpourri effect in the presentation is but a reflection of the myriad of problems we encounter as student and university enter into and proceed upon the path of mutual learning.

The University Educational Program

The selection of foreign students. In the United States a fairly reliable single index for screening applicants for graduate study is the undergraduate academic record. However, in work with foreign students, I am certain that each of us has, at one time or another, been faced with the problem of evaluating a transcript of an unheard-of curriculum in a foreign language from an unknown institution. Although university services may be available for evaluation of the transcripts of foreign students, sole reliance on this technique of selecting foreign graduate students may prove hazardous. Standards among faculties of the same foreign university, or among universities in the same foreign country, may vary considerably. Moreover, in some foreign countries, the nature of the examinations upon which course grades are determined prompts the memorization of facts rather than independent judgment or creative thinking. However, it does not follow that transcripts are useless, but rather that they must be carefully cross-checked with other bits of evidence. It can also be surmised that some students who do not excel in rote memory or possess outstanding academic records from their home universities are nonetheless capable of handling analyses and are creative.

An important supplement to the transcript of academic record is references and letters of recommendations. Whenever possible, we at the University of Minnesota have come to lean heavily upon American agricultural economists stationed in foreign countries for advice on qualifications of applicants from abroad. Professional colleagues employed abroad with the government, philanthropic agencies and educational institutions can assist immeasurably in the evaluation of prospective candidates for advanced degrees. Not only can these colleagues be helpful in the interpretation of grades, but perhaps more importantly, for insights into the individual capabilities, aptitudes and attitudes not readily discernible from college transcripts.

Of course, an all too common failing of many incoming foreign graduate

students is an inadequate command of the English language. How many hours have swelled into personal frustration and how many man-hours of institutional effort have been literally wasted because of simple lack of communication! I am not speaking of the adjustments required of most foreigners to become attuned to the American vernacular or the American intonations, but rather the cases in which English competency is so low as to handicap seriously the newly arrived student. Here again, adequate testing of facility in the English language before the student departs from his home country is most desirable. In some countries, arrangements have been established whereby, under certain conditions, visas will not be issued to students unless they have demonstrated an adequate proficiency in English tests administered by the United States Information Service. Once students are in this country and deficiencies are noted, quick remedial measures should be undertaken. The foreign student adviser's office can usually arrange for tutors. Reading materials in the area of study at progressive levels of difficulty are also helpful. Furthermore, everything that is undertaken at this point aids in developing more satisfactory personal relationships in a strange cultural setting.

In addition to giving consideration to academic background, scholastic achievements, adequate personal references and language facility, a good selection policy would also give preference to students who have had some practical experience in their home country prior to coming to this country to study. Such students usually have an anchor to the wind. They will have a first-hand knowledge of some of the agricultural, business, governmental or social institutions of their own country. Their educational goals will be more clearly defined. Even though their work experience may have been in a somewhat unrelated field, they usually know more precisely what they want to learn that is applicable to their own country. They will benefit more from their experience in this country and will contribute more upon their return.

Orientation to the American scene. Invariably, for the student who survives the selection process, his aspirations, hopes and desires crest at high tide. However, upon entry into this country, he comes face to face with intercultural problems of different ideologies, new social amenities, peculiar language and plain strange noises and odors. Moreover, he is overwhelmed by poorly planned programs for foreign students, peculiar registration procedures, inadequate counseling services and extra fees for foreign students. This is a rather strategic juncture in a different way of life and much can be done by the educational institution to ease the stress and strain of adjustment in a new set of circumstances. Surely, the self-image of the student should not be allowed to slip into low tide at this point.

An early orientation to the agriculture of the region, carried out by means of tours and visits with farm families, will help immeasurably in course work which is to follow. The technical distance between American agriculture and the agriculture of most areas of the world is great, and we Americans tend to forget the chasm in technical terminology that separates us from the rest of the world. For example, time spent working up an inventory on a family farm shortly after arrival in the States will yield high returns in comprehension and receptivity in classes in production economics and farm management during the ensuing school year. An early insight into our social institutions, our rural life and our local government will spark discussion in later classes on land economics, farm credit and agricultural policy.

In common with many of the social sciences, we must recognize that we lack a common language for communication with people from most other countries. Early scholars had a common tongue in Latin. Present day physical scientists can readily brief down a page of scientific symbolism. In spite of the fact that agricultural economists are buzzing about the world like mosquitoes about a Minnesota farmyard during midsummer evenings, we still lack a common lingo of science. Although a science dealing with man's relation to man, our science is one of the least internationalized. Therefore, to gain, most effectively, a working knowledge of our social organization and our community institutions, a foreign student initially might, in addition to the acclimation cited previously, enroll in appropriate courses in agricultural economics and rural sociology at the undergraduate level. Being somewhat elementary and taught at not too difficult a level, these courses would provide more secure footing upon which to launch his more advanced studies. This procedure would be particularly to his advantage if his facility and use of the English language was poor.

Becoming familiar with the characteristics of our agriculture and our social pattern does much to undergird the incoming foreign student, but invariably he is also deeply concerned about our academic practices. He needs guidance on how to plan his time and energy, for the demands of the American educational system differ so greatly from his home country's. The ability to perform effectively within the American graduate school system reflects maturity; it reflects skills of reading, selecting the important from the unimportant and thinking creatively. Many foreign students are unprepared for self-contained courses on a quarter or semester basis, student participation in classes, seminar discussions, periodic examinations, course grades, individual latitude in developing a program of study, and the emphasis on independent thinking.¹

¹ Useem, John and Useem, Ruth H., *The Western-Educated Man in India* (New York: The Dryden Press, 1955), p. 203.

With this general background, I now wish to turn to some of the considerations given to a curriculum for foreign graduate students studying agricultural economics in this country.

The nature of the curriculum. It would be impossible and undesirable to prescribe a specific curriculum for a group of foreign students, even though they were from the same country. Individual foreign students, no different from American students, have different objectives, motivations and expectations of the role they will assume upon graduation. As we counsel, advise and develop programs of advanced study for our American students so, within our limitations, we must attempt to think out a program to meet the individual needs of our guest students. However, there are certain generalizations which can be made in terms of capabilities of the individual student, the resources of our higher educational system, the over-all objectives of the education of foreign students in our country, and the needs of national development envisaged in the students' home countries.

There exist at least two rather distinctive schools of thought on the general type of training that foreign graduate students should receive in this country. On the one hand, we have the "practical" camp; on the other, the "theoretical" bailiwick. The former is the "commonsense" approach of the "practical" man. This is the "cautious, go-slow" policy. The child must learn to crawl before it walks, so it is in large measure our techniques of four to five decades ago that become the kernel of exchange in this transfer of knowledge. If I understand the situation correctly, this group argues that in most underdeveloped countries the general level of education is so low, facilities so limited, farming methods so primitive and data collection so crude that our more advanced research methodology and our finely spun economic theories are out of place. The emphasis is on technique and practice. It is more prescriptive than it is broad and encompassing. In the application of statistics, for example, the logical mathematical basis for research is neglected. The student learns "cookbook methods" without the mathematical background that makes the approach to any statistical problem more readily understandable.

The theoretical approach deals with the flow of great ideas and the conceptualization of integrated, smooth-working systems. Often the men teaching it are convinced that the word "educational" and the word "theoretical" are mutually and monopolistically interchangeable. They maintain that our cultures and set of circumstances are so dissimilar that to spend one's time in the task of developing practical techniques is meaningless. A common complaint is that the theorist does not bring his idealism down to reality and, therefore, what he has to offer becomes purely visionary. A recent incident involving a foreign student in a workshop at one of our leading universities perhaps illustrates the point. The

group had formulated an econometric model containing the allegedly significant parameters for the development of an economy. During the discussion, the professor asked an Indian student what he would do to increase the agricultural output of his country. The student immediately, unhesitatingly replied, "Why, this can be accomplished by increasing the technical coefficients of agricultural production."

Both approaches appear to be fairly intolerant, for advocates of both insist on putting the foreign student through their particular model of the Procrustean bed. That portion of the student which does not fit is conveniently lopped off, and we are assured of a perfectly molded product at the end of the production line.

My thesis is that either method of pursuit is self-defeating; self-defeating for the student, the institution and the over-all objectives of an international educational exchange program. To accomplish our objectives, I believe that we must have a balanced approach of theory and practice with serious attempts to accommodate our system to the needs of foreign students. Neither "practice" nor "theory" are detached oligarchies ruled by specialized scholars but both are a useful and a rewarding part of our intellectual and social lives. Implicit in this approach, is an appeal that we extend ourselves to develop a genuine liberal education rather than an unduly specialized one.

We must recognize that many researchers in underdeveloped countries have scant data and crude data. They cannot use analytical models which call for highly refined data. However, they also have a great need for theoretical training which will aid them to identify, define and understand socio-economic problem situations. Our theoretical offerings should encourage them to carry their thinking to the point where scant and crude data will help them to reach useable conclusions. In other words, we must recognize, as Northrup has pointed out, that scientific methods are relative to the stage of inquiry with which one is concerned.² Thus, much observation, description and classification of the "natural history" type are necessary in the less developed areas. But these inquiries must not be an end in themselves; they must lead to analytical studies which have effective predictive powers based upon what we sophisticatedly term "deductively formulated" type of research. Here, again, what we have cannot be transferred in toto, but the researchers, working in different situations, must be willing and prepared to change premises and assumptions.

Furthermore, although much of the research in these areas must be simple and elementary, there is no need to encourage their social scientists to repeat our mistakes. For example, we wasted much effort on our cost of

² Northrup, F.S.C., *The Logic of the Sciences and the Humanities* (New York: The Macmillan Company, 1947), Chapter III-IV.

production studies; some countries in the Far East have repeated this error. These countries need many *descriptive* studies to give a factual basis for further work, but they can get to important *problems* more quickly than we did by drawing upon and profiting from our experience.

Some words of caution at this point: my view does not overlook the need for different categories and levels of human skills in developing economies. For example, underdeveloped nations have a need for trained personnel in various undertakings such as farm advisory services, community development programs and other vocational pursuits. To meet these various needs one must recognize that different training programs with appropriate objectives would have to be established. Moreover, one must acknowledge that no one type of vocational or educational institution could possibly fulfill all the training requirements. In this presentation, let me stress, I have confined myself to *university* graduate education in agricultural economics. In so doing I wish to emphasize the universality of this approach, particularly if we are to adhere to the tenets of a professional group of university educators and scholars.

Oddly enough, my strong preference for a balanced approach to the curriculum for foreign graduate students is a very practical one. It stems from the repeated experience of seeing graduates in agricultural economics return to their homeland only to join the exodus from their research and teaching jobs to positions of greater responsibility and high remuneration in universities, ministries of agriculture and special agencies. Frequently, I am forced to conclude that their primary skill, or specialized skill, is seldom put to practical use, but their secondary skill or broader knowledge is brought to bear on the work they do. Thus, communication with logic and clarity with fellow men in their community of work and in their nation are important. This requires a deep understanding of fields of knowledge outside their own discipline, for most of the judgments they are called upon to make are not strictly within their specialized field of training. For such responsibilities, they must have the foundation of and the will for a liberal education.

How can we adjust our curricula for foreign *and* American students for great mutual benefits? There can be no superficial adaptation of the tricks by which the telecaster, say, twists his story to bring in a TV commercial about a "thinking man thinking for himself." A total educational experience is a process of maturation, with its intellectual, social and esthetic overtones, that fosters the best development of both theory and practice and their mutual enrichment. In its intellectual aspects there is concern for values and for meaning of facts much more than a possession of factual knowledge. One's mind is continually exploring the marginal areas of knowledge where the findings from one discipline are integrated with

discoveries in another. In its social aspects, there is a breadth of sympathy and understanding of pressures which create tensions and strains in our human relations. In its esthetic aspects, there is the cultivation of a sensitivity and responsiveness to the higher values of life wherever they are found.

Most frequently, we attempt to bring relevance to these dimensions in our lives and in students' development by adding courses in philosophy, logic of science, sociology, political science and history. These efforts are fine. But we should not overlook the splendid opportunities in the conduct of research of encouraging and stimulating critical attention to many of the central notions that we are using. In our guidance on degree dissertations and in workshops on research methodology, we are constantly using such concepts as value, causation, effect, law, truth, probability, possibility, evidence, equilibrium, purpose, goal, mean, end, subjective, and objective. I recall during my graduate school days, one instructor kept us going for six months on one simple question, "What is a fact?" Dr. W. R. Dennes, Dean, Graduate School, University of California, has advocated that we should not consider the meaning of these concepts as "an occasional philosophical luxury or as a slightly comic diversion," but attention should be given to such notions just at the juncture in our research and work where they are "crucial for what we are doing." This procedure, this integration of knowledge, Dean Dennes regards as "the best of all ways to contribute toward intellectual and even emotional breadth and balance in our students and ourselves." In fact, I heartily concur in the Dean's conclusions that "if in our special fields we carry out our own studies and teach our advanced students with great pains to understand more thoroughly the notions . . . and concepts we use . . . we shall do more than we could in any other way to render our work more lively, more interesting, and more conducive to the maturity and breadth and balance which we want to develop in our gifted young men and women as much as we want to develop special knowledge and special skills."³

Special considerations for foreign students. As can be readily surmised, nothing can detract from the fact that the student-professor relationship is the most important element in the success of a graduate program. The professor, working alongside the student—guiding him, encouraging him, and occasionally tempering his enthusiasm—is the essence of graduate education. In view of special problems associated with the training of foreign students, there are certain programs or activities which we can undertake that will augment or strengthen this relationship.

This fall, in cooperation with the Foreign Agricultural Service, United

³ Dennes, W. R., "The Education of the Whole Man at the Graduate Level," *Proceedings of the Association of American Land-Grant Colleges and Universities*, 1951, pp. 238-240.

States Department of Agriculture and the International Cooperation Administration, we are experimenting at Minnesota with a special seminar devoted to the substantive problems encountered by a group of foreign students taking training in our Department. The seminar will consist primarily of a discussion and interpretation of the materials they are covering in their current course work, of developing ideas and plans regarding the adaptation to their home-country situations of the principles, policies and programs they have studied here, and of surveying briefly some problems deemed essential to the objectives of the group but not treated in formal course offerings. To implement effectively and to coordinate the progress of such a seminar, the local seminar leader, a highly qualified agricultural economist now on an emeritus basis, will sit in on the majority of class sessions attended by the students. The arrangement should further assist students for whom regular class presentation is progressing at too rapid a rate and also permit planned observation tours of business and industrial firms, governmental agencies and other installations. Admittedly, procedures such as proposed demand more in staff time and financing than most of us are normally equipped to do. However, with added emphasis and expenditure, the process of helping people help themselves should be greatly enhanced. Experiments along similar patterns have been tried successfully at Michigan State University and Oregon State College.

Some universities are approaching variants of this over-all problem in other fashions. For example, the Office of International Programs, Michigan State University, is a commendable example of bringing together a whole complex of institutional resources and making them readily available to faculty programs and projects conducted at both the home setting and abroad. This form of administration provides support-in-depth; and, moreover, as experience is accumulated and collected from different areas within the University, one forestalls the circumstances of every effort to solve a new problem being a "new voyage to the Indies, only to discover America." At Vanderbilt University, a course in economic development designed specifically for foreign students is another illustration of an institution attempting to make its international training more meaningful to the individual.

Along with these efforts, the special summer course for students of the Far East sponsored in the past by the Council on Economic and Cultural Affairs, Inc., and selected Land-Grant Colleges is also very worthy of mention. In addition to assisting Far Eastern students to adapt what they have learned in their university courses in this country to the needs of their own countries, this special course provides the opportunity to discuss problems as an international group, to gain a greater appreciation of individual country problems and thereby also to promote early professional ties and international understanding.

Now I wish to turn to another aspect of the treatment accorded foreign students. A common dilemma for our departments is the leniency or strictness with which our academic standards are applied. This of course is not a problem peculiar to foreign students, for the problem arises among our local students as well. The problem expresses itself most keenly when an individual instructor has a student whose performance in class is on the borderline, or when the faculty encounters a student whose over-all record indicates he is below average in ability or below average because of personal or financial difficulties. In the adjustment phase, perhaps the first five or six months, most foreign students unquestionably benefit from close and continuous guidance. We must readily admit that in our initial counseling, in spite of judicious use of scholastic records and recommendations, we make errors in counseling as to the level of courses and graduate study load. After the so-called transition period, some students will undoubtedly continue to encounter difficulties due to language, technical terminology and the like. For example, just recently, one of the foreign students in our Department was stymied by one question in an examination because he did not know the meaning of "feeder pig," a term essential for a logical answer. Special sessions for foreign students or individual conferences with advisers aid in uncovering reasons behind alleged weaknesses. Undoubtedly the training for the master's degree can serve to discover students with superior talents. While standards must be recognized as human judgments and not exact measurements, the conferring of "depreciated" degrees, whether to foreign or domestic students, is a disservice to the students and our educational institutions.

Follow-up on graduates. To confer the finest training on foreign students would be of little avail if opportunities for research and scholarly contributions were not available upon their return. The problems of paucity of equipment and materials, lack of sympathetic understanding among supervisors and administrators and inadequate finances to conduct investigations are very frequently almost insurmountable obstacles to the returnee, particularly in the social sciences. As a matter of policy, more attention should be given research grants-in-aid to encourage the professional growth of individual scientists and to stimulate the development of the field of agricultural economics. Once a basic investment in the human resource has been made, further investments in research funds—and they need not be large—would unquestionably, in my opinion, result in added dividends in more productive scholars and greater scientific output. This is an area which can be quite easily promoted by private foundations and, in cases where sister-to-sister university contracts exist, by our educational institutions themselves.

Nor should the trained scientists in foreign countries be left in isolation.

There is a need for periodic workshops and in-service training centers to keep these men alerted to the empirical research and study being done in neighboring countries. Moreover, these would serve as stimuli to do more and improved research. Greater circulation of completed research, the formation of national farm economics associations and participation in international professional organizations, such as the International Conference of Agricultural Economists, would also serve to foster the development of agricultural economics.

Summary and Conclusions

Since education of foreign students is considered worth doing, it is worth doing well. The success in the cooperative international exchange of knowledge and skills is dependent upon a host of factors, including early identification and selection of talented scholars; assistance in adjusting students to our cultural and academic life; the development of a balanced graduate program of study, pursuing not only theoretical concepts and the acquisition of practical methods, but also, in the true university concept, the integration of these with other study in terms of the broader implications and social obligations; and, finally, the active encouragement and maintenance of professional and personal ties among agricultural economists of various nations. But no matter how much we preach principles, no matter how much we generalize, we must not slip from the central tenet of our democracy and educational heritage, that every person is unique, that every person is an individual. Therefore, transcending course content and teaching methods is the pervasive relationship of educator to student and student to educator.

Our educational philosophy is founded in hope and optimism. We envisage that a better life can be created for millions of people in other lands and in our own. Beneath the turbulence of the surface waves of the cold war and international political tensions moves a steady current of a positive, constructive program of the most advanced knowledge that we have about man, which agricultural economists can help systematically, patiently and sympathetically to marshal and thus enrich the lives of us all.

PREPARING FOREIGN STUDENTS TO STUDY FARM ECONOMIC PROBLEMS IN THEIR OWN COUNTRIES*

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THERE is a basic difference between training in agricultural economics and training to study farm economic problems—i.e., to conduct significant, meaningful research studies. Foreign students, interpreted here to refer primarily to students from Southeast Asia countries, may study at any one of a large number of American universities. They may become well educated in the field of agricultural economics, and still be unable to conduct economic studies of value in their own countries. This happens to our own students also! To become a competent researcher takes more than an agricultural background, a good personality, a scholarship, a prescribed number of semester hours of course work or terms of residence credit, and "subsistence" at an institution of higher learning.

Comment on Our Procedures

I believe that our basic problem in training foreign students in research is our failure to understand conditions in foreign countries and to appreciate the differences in points of view between the people with whom we conduct research and the people with whom students from other lands must work. One might easily criticize our institutions for their procedures in training students from other lands. Of course, our programs were not established for students from other countries. Thus, any help that such students get from these programs is likely to be both accidental and incidental rather than the result of a well-planned study and training program.

Do we not, in our teaching programs, naturally tend to emphasize our institutions and methods of operation and points of view rather than those of some other region or country? Do we not illustrate and discuss the way we do things now, which may be satisfactory for our students, rather than how we made our first steps forward and away from practices and institutions of yesteryear, which might be more appropriate for students from other countries? Have we not failed to recognize that countries in Southeast Asia are vastly different from ours? That their people have different customs, beliefs, and motivations? That it is impractical, if not completely inadvisable, to transplant our points of view, methods, and institutions directly to these countries? Perhaps less emphasis on what we do and more on what we did would be more meaningful, but I am sure it would be most difficult to accomplish.

* The author wishes to acknowledge the helpful suggestions of colleagues G. W. Hedlund, C. D. Kearn, and H. von Oppenfeld.

Do we emphasize sufficiently in our research methods courses when to use the different research techniques, the data that should be obtained in different types of studies, and the most appropriate ways of getting such data? Since some research techniques certainly are more appropriate here, where we have a tremendous backlog of information, than in other countries where little or no background data are available, I believe we need to give more attention to the question of when to use the different methods of study.

How many times have students been given thesis topics that have little or no application in their home countries? This is the easy way—for us! It benefits us, not the student. In other words, he conducts a research project, based on our conditions and needs, that may result in information of value to us, but useless to him.

Have we taken the time to teach students from other areas how to discover and recognize research problems? Do we explain how we discover our own problems? Too often, I suppose, we even fail to admit that we have problems.

Some Factors That Make Research Work Difficult

It would seem appropriate in this type of discussion to consider, first of all, the major factors that make research difficult in other lands and that all too often frustrate research workers in their programs.

Perhaps the most important problem is that of getting the research results accepted by the people. I am sure that agricultural research information is available in the Philippines, for example, which if applied could result in major changes in agricultural activities. But these research results are not accepted. Why? Undoubtedly there are many reasons. Some of the more important ones are:

1—A relatively high degree of illiteracy or near illiteracy in the agricultural population. With nationwide illiteracy rates of 35 to 80 percent common in the Southeast Asia areas—and probably higher rates among the agricultural people—the task of getting new and better methods accepted is tremendous.

2—A philosophy of life that places relatively higher values on the social rather than the economic aspects of life. In the Philippines, for example, time spent in farming is frequently considered as detracting from the extent of social activities possible. As a result, there is often little interest in activities that mean more time spent in agricultural production when it is possible to get by without the extra activities and production.

3—A social system in which the rewards for individual initiative are shared widely rather than credited to the individual. Should an individual producer adopt improved practices and increase his production, chances

are good that "less fortunate" blood or religious relatives or even other people would soon move in to share the gain.

4—A reluctance on the part of rural people to change their ways of doing things. Of course, this may be the result of other considerations, but the cautiousness or virtual disbelief with which research results are accepted can be most frustrating. I've seen a greatly improved shipping container for vegetables not accepted because it would put the bamboo basket weavers out of work. I've seen a large supermarket accept only five half-kilo packages of a product in a packaging experiment. Even though the first five customers for the product eliminated the display, management continued extremely cautious.

5—A high proportion of the farms are self-sufficient. In the Philippines, for example, about 60 percent of the farms reported annual receipts of less than \$100, and many had no cash receipts.¹ Clearly, the type of research done and the methods used must be geared to this situation rather than to the dynamic commercial agriculture that is emphasized at our institutions of higher learning.

A second major problem is the lack of an integrated or adequate extension system for transmitting research results to the people and for informing researchers of problems that need attention. As a result, research workers are often completely unaware of the real problems that agriculture faces.

A third problem—and one that doubtless exists among research people everywhere—is the lack of adequate funds to conduct research. The severity of this situation in countries of Southeast Asia is difficult to portray, unless one can visualize a situation where an entire department may operate on fewer funds than are available for an individual professor or a single research project in this country.

The number of dialects used by people in many countries poses an intriguing problem. Either special enumerators must be employed to work in particular areas, which requires an unusual amount of training time, or an interpreter must be used to assist in the conduct of studies. In either case, one can't help but wonder if the data obtained are accurate or even related to the original questions.

Nationalistic tendencies in some countries are so strong that minority groups, which often are important in agricultural trade as well as other activities, suspect the motives of research workers and refuse to cooperate or take refuge in the excuse that they fail to understand.

Another situation that exists in many countries is the tendency to get

¹ H. and J. von Oppenfeld, J. C. Sta. Iglisia, and P. R. Sandoval, *Farm Management, Land Use and Tenancy in the Philippines*, Univ. of the Philippines, Central Exp. Sta. Bul. 1, August 1957.

action programs ahead of research. This stems from an attempt to get ahead and to develop as rapidly as possible, but it creates tremendous problems since researchers are kept busy trying to develop cures rather than preventives.

Last, but not least, administrative practices appear to be much more "highly developed" in some countries than in our own. This leads only to countless delays in obtaining approval of projects and in initiating and conducting the work.

Some Characteristics of Students

It would seem appropriate, also, to comment briefly on some of the characteristics of students from the Southeast Asia countries that should be considered in developing a valuable training program for them.

At the outset, we must recognize a concept common to most peoples of the world—that to work with one's hands rather than to hold a "white collar" supervisory position is to lower one's self. This leads many students from other countries to tend to avoid training and work that we would consider proper and necessary for agricultural economists.

A second characteristic that Americans will notice in working with those from Southeast Asia countries is that many of the students show the results of early training in an educational system that emphasized memorization of facts rather than application of principles. These students know how to calculate a statistical measure or how to follow a research technique but not when or how to put them to practical use.

A third characteristic of many students is that they are willing to accept the static conditions in their own economies rather than to anticipate changes that might be brought about. They lack the incentive, or perhaps the courage, to look objectively at their customs, laws and governmental programs. It is my belief that the essential ingredients of a good research worker are the ability to criticize existing conditions, to be dissatisfied with the way things are done, and to be ever alert and seeking ways of making improvements. These characteristics need to be instilled into our students from other lands. Perhaps they are, but the problems of shifting practices and methods are so great, especially when there is a tendency to want to change the whole system at once rather than slowly and patiently, that the easiest way is to accept rather than challenge conditions.

A fourth characteristic of many students is the tendency to be most interested in major, policy-type studies, such as "long-range planning from an agricultural point of view," which they hopefully expect will provide the magic key to major changes in their country's economic life. It may be that they feel this type of research better qualifies them for a government position. A problem we face is how to get many of these students con-

cerned with research work closer to the grass roots of their agriculture.

We must recognize too that the "latest fashions" in our research methods have a tremendous attraction for workers in other countries. There is no doubt that in America, where a large volume of economic data is available, new research techniques are appropriate and needed. Some of our techniques, if used in underdeveloped areas where limited or no background data are available, may be of little or no value. There is nothing wrong with knowing how to use all the research techniques, but it is important to know when to use them. In many respects, workers in underdeveloped areas should start farther down the research ladder and collect some basic facts on the characteristics of their agricultural production and marketing systems before they reach the point at which it becomes appropriate to use more advanced research techniques.

A great majority of the students from Southeast Asia areas do not have agricultural backgrounds. The young men with such backgrounds usually are unable to attend college. The job is to teach these students not only how to conduct research but also how to become acquainted with the agricultural production and marketing systems with which they are to work. Perhaps it means, too, that we should be somewhat more selective in admitting students, accepting only those who have a basic knowledge of, and a real interest in, their country's agriculture.

Students, in general, have been found to be poorly trained in agricultural economics, with little or no experience in research. In our attempts to train them quickly, I suspect we resort too much to formal course training. This restricts training in research methods and procedures to one or two courses and to the student's own initiative.

Ways to Improve Training For Research Work

To develop a useful research program in agricultural economics requires, first of all, that research workers must be familiar with their agriculture. This is a job for the students. We can't do much about it. However, if we recognize that most foreign students come from countries that are economically, technologically, and educationally 50 years, more or less, behind the United States, and that they are not well acquainted with their agriculture, then at least we can encourage them to become familiar with their agricultural production and marketing systems. Most Americans would be shocked to discover how limited a knowledge many foreign students have of conditions in their own countries, or how limited a supply of economic data is generally available.

Although descriptive studies have been frowned upon so much in this country that our colleagues in other lands hesitate to use them, students should be encouraged to make use of such studies, where appropriate, to become acquainted with and to obtain basic information about their agri-

culture. Such studies, of course, should be more extensive than mere censuses; they should include information on practices followed and data from which relationships may be determined. Findings from such studies would provide "home-grown" material for use in teaching programs and would give alert research workers some ideas concerning problems that need to be studied in more detail, with other more appropriate research tools. An understanding of their agriculture would be of tremendous value to research workers in choosing the most appropriate research methods to use. I am sure it would eliminate many needless countrywide studies which require tremendous resources, when other research procedures might will be more meaningful and appropriate. For example, hog production in the Philippines, as in many other areas, is largely a scavenger deal. The hogs just take care of themselves. Yet a nationwide study was made of costs of producing hogs. A tremendous amount of attention was given to drawing a reliable national sample, but the appropriateness of the study and the data to be gathered were given little thought. In another area, the first ambition of an economist was to make a nationwide survey of farms when the person involved knew little if anything about the farms located within sight of the educational institution!

Second, to develop a good research program, students must be able to select important problems on which to work, to select appropriate research methods, to obtain the necessary data, and to analyze them properly. This is our job. We must teach them how to do this. In addition we must impart to students from other countries a sense of desiring to serve their agriculture, a willingness to work and not just to supervise, and a critical attitude regarding conditions in their countries and their activities.

How can we best do our job of training students from other lands to study economic problems in their own countries? I haven't all the answers, but I'd like to suggest some possibilities that will make our teaching more effective and that will help these students to contribute to their country's growth through effective research programs.

First, these students, after a period of training in the United States, need to be brought back to the hard realities of life in their own countries. They must shift their thinking from a commercial agriculture to a self-sufficing agriculture, from an agriculture that provides year-around employment to one that provides only half-time employment, from supermarkets and prepackaging to public market stalls and banana leaves, from the latest fashions in research techniques to those that are the most appropriate, and from the luxurious life of a student to the often thankless one of a research worker and a teacher with a responsibility to do something about the agricultural production and marketing systems in their own countries despite inadequate resources with which to do it.

There are a number of ways in which this might be done.

(a) At selected institutions a particular professor might be designated as responsible for the training programs of all students from other areas. This would require a man who is well acquainted with conditions in other countries and who would be free of other responsibilities so that fully half his time could be spent with the students. This man should be familiar with the educational program of each student and should conduct a seminar during the year dealing with the application of the formal training to home conditions. This should be a most effective training procedure, and one to which more attention might well be given by those who train students from other areas.

A modification of this suggestion would be for each professor teaching courses in which there are students from other countries to hold an extra session once each week for these students. During this extra period, special attention could be given to applying the course material to the home conditions of students.

(b) An omnibus type of program might be developed in which students from other countries would be given an opportunity to examine many aspects of our agriculture. Appropriate seminar-type discussions would follow, designed to contrast our methods with those in other countries, and to assist the students in applying their knowledge to home conditions and in determining particular types of research needed.

(c) A special training program could be established to follow the formal training period of students from other lands. This might consist of a summer session, as has been done by the Council on Economic and Cultural Affairs. However, a summer session may be more frustrating than helpful unless staffed properly. Therefore, I would propose a full semester in which these students could work with a selected group of instructors and attempt to apply the formal education they have obtained to conditions in their home countries. Such a program could be held at one particular institution or rotated among different institutions, as were the special training schools sponsored by the Council. If the program were limited to a summer session, during which time it would be easy to assemble a competent staff, a rotation program should be satisfactory. If the training program were to be a full semester in length, then it would be more appropriate to locate at a particular institution.

A second and highly important way in which foreign students may be prepared to study economic problems in their own country is to send visiting professors from American institutions to foreign schools. The responsibility of such professors would be to serve as research advisors to local workers. Such men must be willing to learn quickly the conditions within the country and to show by example how problems can be determined or discovered, how to plan research programs and how to choose appropri-

ate methods to study the problems effectively. This cannot be done from behind a desk! One of the major advantages of a visiting professor program is that a trained research man would be available throughout the year to assist in adapting research procedures to conditions that exist within the country and in the analysis and interpretation of the data. Many Americans on such assignments want to accomplish too much too quickly. A liberal amount of patience is necessary if good relations are to be maintained.

To overcome the problems imposed by lack of research funds, students from other countries need to be advised of ways to derive the most benefit from the limited resources available. Conceivably this may involve teaching a research methods course for undergraduates with a view to using student help on research studies as well as training future research workers. Likewise, periodic conferences of workers should be held within the region to give research workers a chance to get acquainted and to share experiences concerning problems and procedures. Such periodic meetings could be enhanced through an organized system for the exchange of appropriate publications.

A student from a foreign country who plans to study in the United States should be encouraged to use, as a basis for his thesis, economic information obtained from a study he conducted in his own country. I grant that this may be extremely difficult in many instances. One situation will illustrate what can be done. A student from one country, upon being admitted for study at one of our schools, wrote to a staff member concerning a suitable thesis topic. By correspondence they developed a thesis project that would provide some badly needed information regarding a particular problem in the student's own country. Although such a study may lack intimate guidance during the data-gathering period, I am sure that it will be far more meaningful to the student than if he were to come to this country and make a study of supermarkets, large-scale dairy farms, or some other problem that we'd like to have studied. A visiting professor program could do much to implement this suggestion. I would further propose that upon completing the requirements for the M.S. degree at one of our schools, students from other lands return home and work in their chosen field for a few years before continuing their graduate program. Their return to the United States for further study should be contingent upon evidence of their interest in agricultural economics and ability to conduct worthwhile research.

Last, but certainly not least, foreign students should be continually reminded that their research programs must be geared primarily to meet the needs of a self-sufficing agriculture and must be of obvious value to their agriculture or to their government. We must recognize that our re-

sources and our agriculture are vastly different from those in other countries and strive to make our educational programs more meaningful for students from these lands if we are to do a respectable and useful job of training them. Otherwise, the formal research training obtained in one of our schools is likely to be of little value to foreign students.

DISCUSSION: POSTGRADUATE INSTRUCTION FOR FOREIGN STUDENTS

TROY L. STEARNS

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In the three excellent papers just presented, there seems to be an admirable unanimity of agreement in recognizing the desirability of and necessity for American universities and colleges to assume responsibility for expanding and improving their present programs for the training of students in agricultural economics from less developed countries. Substantial agreement can also be seen in other instances, such as identifying problems inherent in existing programs, in the basic philosophy underlying suggestions for bringing about improvement, and in the proposed procedures for accomplishing constructive change.

It would be presumptuous of me to repeat or re-emphasize what has already been said so well; but in view of observations made during my residence and work at the University of Malaya in Singapore and the Federation of Malaya during 1958-1959 and my work on an educational mission in Korea in 1948, I should like to raise some questions and make comments relative to points which, undoubtedly due to restrictions on the length of the papers, were minimized or omitted. I should like to deal with four of the major phases of the student training program: selection, orientation to the United States, the nature of work in the graduate program, and follow-up activities.

I. Screening and Selection Process

a. Could the initial steps in the screening process for selecting students be started as early as the junior year in undergraduate work?

b. Could better tests be developed to cover all areas found difficult by former students from less developed countries (English, both written and oral, mathematics, statistics, etc.)? These tests should be given several months in advance of the student's anticipated enrollment in a university or college in the United States. If the prospective student fails to show a proficiency in these areas in the first examination, he should be encouraged to study and submit to re-examination several months later or be required

to make up such deficiencies in the United States before he can become a fully recognized student permitted to take work in agricultural economics. This should be done for the sake of the student himself and for developing more respect for United States standards. We are not respected either at home or abroad for making work easier for students from other lands.

c. Could adequate provision be made to show how aware the student is of problems and needs in his own culture?

d. Could more specific information be made available to the potential students dealing with financial requirements, job opportunities, living conditions, educational methods? What will be expected of him in the United States and what he can expect of the United States in return? Such a publication produced cooperatively by former students from other lands, students from other lands now studying in the United States and cooperating institutions would have considerable merit. Other sources of good material could be obtained from logs or records required to be kept by students showing their reaction, needs, growth, and actual expenditures in the United States.

II. Orientation to the American Scene

a. Could a series of informal meetings for all new students be provided at a central location where they could be given pertinent information about life and education in the United States? Professors who have worked in other countries and students from other lands would make effective staff members for a group of this sort.

b. Could a trip giving a cross-section of life in rural America be developed and be regarded as a part of the regular work program? This would provide basic concepts and a better vocabulary for the student before formal instruction begins in the classroom. During this trip, or at a later time, students should have an opportunity to see how cooperative associations develop and carry on as in Nova Scotia and elsewhere, how the Tennessee Valley Authority has improved standards of living for the people it serves, how good community school programs operate and how schools such as Tuskegee Institute, Berea College and the Martha Berry School meet the needs of their students.

c. Could an opportunity be provided for the student to receive immediate recognition and help by fellow students and by at least one staff member upon his arrival at the university or college of his choice?

III. Nature of the Graduate Program

a. Could a special meeting be held prior to the start of the regular session to ascertain what comprehension the students have of graduate work in the United States?

b. Could special arrangements be made to hold periodic sessions with foreign students to help clarify problems arising in their work? The seminar the University of Minnesota plans to carry out this year is an excellent example of what could be done.

c. Could an increasing effort be made to relate class work frequently to agricultural life and problems in other countries?

d. Could a maximum of outstanding examples be made available for study on how change has been brought about both in the United States and in less developed countries?

e. Could more opportunities be provided for regional seminars for professors and students to exchange experiences?

f. Could more adequate first hand experience in planning and conducting surveys and practicing "down to earth" research be provided?

g. Could serious consideration be given to the awarding of grants for attendance at United States universities wherein the attainment of a degree would not be felt to be a necessity by the student or cooperating government? Certificates of merit or attendance could be awarded instead of degrees. This might help to eliminate many of the problems of students and of degree-awarding institutions.

h. Could the dissertation be replaced with a project or series of projects related to the student's own country? The problem could be completed after the student returns to his home.

IV. Follow Up

a. Could a seminar of two or three weeks duration, for the exchange of experiences by overseas students, be arranged before they return home? This seminar would make possible a frank appraisal of the effectiveness of the work in United States universities and colleges. Such ideas as these might be considered in the seminar:

1. What helped us the most?
2. What helped us the least?
3. What things did we need to do that we didn't do?
4. What are the major problems in agriculture in our countries and how can the experiences we have had in the United States be helpful to us in dealing with these problems?

I realize that these suggestions may seem too time consuming and expensive for students and universities alike but on the basis of my experience abroad and as a teacher, I feel that more time spent in selection and orientation will ultimately mean both time and money saved. It comes as a shock that American degrees are not recognized per se in many foreign countries, and that far too many prospective students feel that obtaining a degree in the United States is a snap. It is also shocking to learn of

the misconceptions students have of life in the United States. Many examples of these misconceptions were made too clear to me in personal interviews with education students in the University of Malaya. For the sake of the students themselves and for our own universities, I feel that we must do far more in developing first hand practical experiences, both inside and outside the classroom, which will rid our overseas students of many stereotyped conceptions and will also relate more closely to problems they will face in their own countries when they return home.

DISCUSSION: POST GRADUATE INSTRUCTION FOR FOREIGN STUDENTS

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Ohio State University

"People are the best investment" is a good summary statement of the guide lines followed by Lewis, Berg and Darrah, as they write with deep social insight and with some polite restraint out of their own experience on "Post Graduate Instruction for Foreign Students." Since I agree so thoroughly with them, I can only re-phrase a few points. In order to sharpen discussion, however, let's state these points in more blunt street-talk style.

1. Many of our excellent research scholars are not skilled in teaching method. This puts us further behind the eight ball in communicating with students from another culture. See teaching methods later.

2. Explain carefully to our foreign students, members on our team, that improving their farm economics is evidence of our grave concern about "saving the world." We must understand, appreciate and help one another lest we destroy each other.

3. Insist to these co-workers that Agricultural Economics is definitely a tool for helping people to help themselves. Understanding implies responsibility. These countries must produce more food, more efficiently and cut down their rate of population increase.

4. Our agricultural economics is too highly specialized for most foreign students when we impose on them in one dose a complete theoretic system. Attach small pieces to parts of the students' experiences having meaning.

5. Arrange for these students to visit and observe many simple result demonstrations. Do this also at the methods level. For example, in our corn growing practices in the Punjab, the simple hand corn jabber is the first piece of improved machinery to be introduced. Have the local mechanic make such tools.

6. Recognize the difficulties of *re-developing* countries that are not merely *under-* or *less-developed*. These civilizations were jelled in a presci-

entific age. Ancient molds are only cracking. Authoritarianism still prevails. Motivation rests upon another world basic value system. Status, for example, is what the student covets in the higher graduate degree, not necessarily how much more effective one can be. On the other hand many conscientious students shudder at the thought of returning to work under a government administrator who has no inkling of a capable scientist's contribution.

7. Emphasize to these students the importance of local program planning and self-government. The central government sets too many targets. Administrative officers too frequently exercise their authority rather than coordinate resources or give any helpful supervision. The scientist waits for government sanctions—waits until the season is too far advanced to plant the seed or apply the fertilizer as directed by the government in the first place.

8. Stress relationships in the sense of community teamwork—all kinds of relationships, going beyond our too-readily assumed research-teaching-extension cooperation. Not only must we demonstrate freedom from jealousy among cooperating scientists, but also an eagerness to exchange help with and give credit to any number of other resource agencies—government divisions, colleges, missionaries, United Nations, International Cooperation Administration, private organizations, etc. Train men to inventory all resources and demonstrate how to enlist their cooperation.

Now, what about principles in teaching methods and organization? Even though our own super-advanced development stage gives us "Mr. Inside" (Atom) and "Mr. Outside" (Space) to carry the ball for us, we had best stick close to fundamentals:

1. Use the problem solving approach. Explain, expound and clinch theory as derived from experience in working out field problems. In introducing rural sociology in the Punjab we began with class members' data about themselves: Caste, village size, father's business, ownership of bicycle, marital status, religion, age, size of family, favorite recreation, etc. How the ways of meeting man's needs—family, religion, business, government—grew into institutions became apparent through personal experience.

2. Alternate skull drill with scrimmage. One of the weekly field visits practiced during the Council Seminar at Ohio State University in 1958 took the boys to a multiple-type cooperative. To sit around on the feed sacks, climb on the incoming wagon load of grain, follow this grain through the shutes to the drying bins, sift fertilizer through the fingers in the mixing shed, return to talk with the weigh master, see the farmer pocket his credit and debit slips, ask him about his owner shares, find out that no government orders are involved—all of this is watching Eco-

nomics at work. Attitudes as well as capital, management, machinery and labor were scrutinized. Back in class roundtable discussion next day the members learn from the experts that co-ops handle about 30 per cent of Ohio's grain business. This is enough competition to stimulate innovations and improve business in the interest of the public and a free society.

3. Station some experienced coaches over there. I met Larry Snyder, Ohio State's famous trainer of Jesse Owens, at Patiala, Punjab, coaching the India track men for the Melbourne Olympics. Why not keep some of our skilled research men in the field at the elbows of students defining their home problems? To produce finished native coaches, return to the United States from time to time some of these selected researchers, teachers and extension specialists.

4. Build up some in-service coaching centers in Southeast Asia. Seminars for representatives of several countries will provide for the exchange of experiences, information, skills, attitudes and insight. Out of this may grow adequate universities. But such a coaching center must include administrative authorities in order to give the green light to the agricultural economists.

5. Keep the personal, friendly activities in our own economics courses. Our foreign students have some unrevealed attitudes toward us, and some unconfessed problems. Representatives of each of the seven Asian countries prepared favorite national dishes, served smorgasbord style in a home. What an afternoon and evening of intimate exchanges this occasion was! Then, too, the day that we visited in the Hazlets' farm kitchen, a do-it-yourself remodelled job, done to accommodate a freezer and other labor and food saving equipment, we saw how a family planned together. This investment released some time for Mrs. Hazlet and the children to help in the dairy barn. We went out there to see how remodelling was being done in order to meet Class A requirements.

6. Encourage, practice and teach discussion with its give-and-take democracy, where seniority and caste are tossed out the window, where recognition of individual worth and progress replaces superior-inferior and other static concepts. Beneath this dynamic philosophy the agricultural economist puts a base of production adequate for the good life and a vision of a better future.

UNDERGRADUATE TRAINING IN AGRICULTURE

Chairman: W. F. Henry, University of New Hampshire

THE PHILOSOPHY OF UNDERGRADUATE EDUCATION

H. B. JAMES

North Carolina State College

N EARLY a century has elapsed since the first Land Grant college was established. During the past century these institutions have had a tremendous influence on the development of agriculture and the entire economy of the United States. Their influence has not been confined to this country alone; in fact, the entire world has felt the impact of these important and unique educational institutions.

Recognition of the significant contributions of the past does not necessarily involve an endorsement of present programs. As economic and social conditions change, the major functions and programs of the Land Grant colleges should be re-examined to determine whether the needs of society are being met for living in a modern world. It is not within the scope of this paper to deal with all aspects of this problem; however, emphasis will be focused upon one important function of the Land Grant college, namely, resident instruction. An attempt will be made to point out some of the changes that have occurred in agriculture and to offer some philosophic suggestions for improving undergraduate education.

A New Concept of Agriculture

In an address on education and self-education, Whitehead said, "There have been moments in history when new worlds were discovered. There was such a moment when Columbus discovered America. Creation widened to man's view. There is such a moment now. We are all aware that the immediate future holds within it possibilities different from anything that has been known in the past. Our views are widened.

"Mankind has entered upon a new phase. It is no good saying that you will go on in the future as you have in the past."¹

Today our views of agriculture have also widened. Agriculture is undergoing many rapid changes in the United States and in the world. As a result of the recent adjustments in agriculture, a new concept of agricul-

¹ Alfred North Whitehead, *Essays In Science and Philosophy*, Philosophical Library, New York, 1948, p. 123.

ture is emerging. In this new concept, agriculture is defined to include three important segments of our economy.

The first segment includes the farmers themselves who are engaged in the production of crops and livestock. There are eight million people employed on farms in the United States.

The second segment includes those industries which furnish supplies and services to farmers. This group of industries employs about six million people and is vital to the emerging concept of "agribusiness."

The third segment includes those industries and commercial enterprises that process, store, handle, and merchandise the products of our farms. This is the largest of the three groups in terms of the number of people employed. Currently, this group of industries employs about ten million people.

Taken together, these three groups employ approximately 37 percent of the total number of persons employed in the United States. Think of it—more than one out of every three employed persons work in agriculture. Any way you look at it, these three groups are important segments of the national economy.

By defining agriculture in this way we are able to draw a sharp distinction between farming and agriculture. Historically, agricultural curricula in Land Grant colleges have been developed with the primary objective of producing graduates who were ostensibly to become farmers; thus little or no distinction was made between farming and agriculture. In fact, if you were to walk into a high school and ask the students what the word agriculture means to them, about nine out of every ten would say "farming." The training of farmers is important and we should continue to do the best job possible of training those who wish to return to the land, but this in itself is no longer adequate as the sole function of an agricultural college.

It is not enough to have efficient farmers. The supply industries must be efficient, the processing and marketing industries must be efficient; in fact, all segments of agriculture must be efficient if we are to compete effectively with synthetic products and other regions of the world in the market place. To make agriculture perform as well as it is capable of performing will require many well trained agricultural men. The Land Grant colleges have a responsibility to provide these men.

New Curricula for Agriculture

A new program of instruction is needed to meet the needs of a modern agriculture and to develop enlightened citizens for the kind of world we face in the years ahead. In many Land Grant institutions curricula development has not kept pace with technical, economic, social and political

change in our society. Past programs have been aimed mainly at farming rather than agriculture in its broadest sense. Programs have been weighted heavily with applied training and have been weak in fundamentals. Many curricula have failed to achieve a reasonable balance between science, technology, and liberal arts and thus have failed to produce the kind of behavior in their graduates for which they were planned. Colleges should provide their graduates with the kind of training that will enable them to solve the new problems that continually arise in a dynamic society.

Curricula development is subjective

If one of the major objectives of an educational program is to ameliorate the behavioral pattern of students, then one must consider what patterns the students possess at the beginning of the educational period and what kind of pattern is desired at the end of the period, or in the years immediately following graduation. The process of determining the objectives for a curriculum is subjective—that is, it depends upon the sets of values and the information available to the individuals who determine the objectives.

Inasmuch as curricula development is subjective, many arguments and much difference of opinion on the part of students, staff, and educational leaders ensue. These differences of opinion arise because of differences in sets of values and differences in the background and training of the many individuals involved. Because of the subjective nature of curricula development and the difficulty of obtaining scientific evidence to support one's basic philosophy about education, the entire teaching staff usually participates in curricula building. This means that many sets of values and many different backgrounds and experiences become involved and must be resolved or compromised in determining the objectives and best procedures for educating students.

The twin objectives of "learning how to live" and "learning how to make a living" must be kept in mind as the new curriculum is developed

Most institutions are not interested in training mere technicians. As has been said, "Man does not live by bread alone." We should be interested in producing educated individuals who are not only technically competent but also capable of assuming roles of leadership in an increasingly complex society. Haphazard curricula do not develop such individuals. One must have clearly in mind the behavioral patterns desired as the educational program is planned. Our graduates of tomorrow will live in a world with increased leisure time and in which social problems will become increasingly important as we attempt to live peacefully with our neighbors of the world. Therefore, regardless of the background of the individuals

developing the curriculum, these two objectives must be repeatedly re-emphasized.

The concept of minimum levels of attainment for a degree

Regardless of what is taught in a college curriculum, the behavioral pattern of students will undergo some change. Therefore one must formulate objectives which can be used to guide the development of educational programs. The concept proposed here is one of minimum levels of attainment in specific areas of knowledge. The idea being that if a student reaches a minimum level of proficiency in a specific area of knowledge, he will have sufficient background information to produce a more desirable behavioral pattern in later years. To insure that a student has achieved the minimum level of attainment in a specific area, one could administer different kinds of tests or require the student to complete certain academic work in the area involved, or a combination of the two approaches might also be used.

The concept of minimum levels of attainment is a valid one to insure that a student not only meets minimum standards where degrees are awarded, but also has a reasonable balance of training in the various disciplines and areas of knowledge that are essential in meeting the objective of the educational program.

The concept of maximum freedom for the student

Students are not a homogeneous group, and fortunately so. They come to college from different places with different backgrounds and with different objectives in mind. Consequently, each student wants a slightly different program. How much freedom should the student be given to develop his own program? Opinions on this subject vary widely and curricula vary from those with little or no freedom available to those programs which allow considerable choice on the part of the student. Some staff members feel that all students should be made to take certain courses. Others feel that students should be permitted to take the courses of their own choice and then the faculty should decide what kind of degree will be given the student when he has completed a prescribed number of courses. These are interesting extremes. There should be a reasonable compromise which would protect the standards and attain the objectives of the institution and yet meet the needs of individual students.

The great compromise

Some compromise will be inevitable. Obviously to bring together the two concepts of minimum levels of attainment for a degree and maximum freedom for the student will involve some compromise. Since curriculum

development is subjective, there is no way of proving whether the compromise is optimum in terms of the objectives sought. One must simply evaluate this in subjective terms. But one can re-evaluate it often and thoroughly.

One way to deal with minimum levels of attainment is to think in terms of the areas of knowledge with which one is concerned. Suppose we assume that a total of 120 semester hours are required for graduation. Ten percent devoted to languages would permit four courses in this area. If we assume 150 semester hours as a requirement for graduation, then five courses could be required as a minimum in the language area.

Another category could be the social sciences and humanities. In this category the student could take some work in history with the idea of giving him a better understanding of the problems man has faced over time, how he went about solving them, and how this experience can be used in solving present day and future problems. Some work could be taken in political science to give the student a better understanding of the kind of political system we use and how it affects the lives of individuals and the growth and development of society. One could include some psychology to give the student a better understanding of individual behavior and sociology to provide a better understanding of group behavior. Economics could be included to give the student a better understanding of our economic system and how it operates and of how to operate an individual enterprise in the most efficient way. One could go on and on pointing out work which could be included under this category but the above should serve as an example of the disciplines which might be involved.

If we should allocate 20 percent of the student's course requirements to social science and humanities, then he could expect to take somewhere between eight and ten courses in this area as a minimum requirement during his four years.

The physical and biological sciences could be listed separately or could be grouped together. Suppose we group them together and allow 20 percent as a minimum requirement for any student graduating with a bachelor of science degree in agriculture. This would permit the student to take between eight and ten courses in this area and would permit a year of mathematics, a year of chemistry, a year of biological sciences, a course in physics, and perhaps another course in the biological area. This would be the minimum for any student. Students interested in science would use the minimum as a foundation on which to build a much stronger program.

The next area I have designated as "restricted electives." I would propose to set aside 20 percent of the student's total time to be allocated to courses which would be selected by the student and his adviser, depend-

ing upon the general area in which the student wanted to study. For example, if the student was interested mainly in science, then his electives would be selected from a prepared list which would include only science courses. Should the student be interested mainly in business, the restricted electives would come entirely from a group of economics and business management courses. Eight to ten courses would be available in this category. Suppose a student was interested in the biological sciences. He could take eight to ten courses in the physical and biological science area which together with the 20 percent already devoted to sciences would permit him to have about 40 percent of his work in physical and biological sciences. In addition, he could elect more work in this area.

The next category I would designate as "major requirements." Here again let us assume that 20 percent of the total will be set aside for a major. These courses could be additional science courses, additional business courses, or could be applied science or technology courses. The department offering the major would attempt to use this amount of time to give the student the best possible training in the chosen major.

Suppose we call the next category "free electives" and allocate 10 percent of the student's total course requirements to it. This would permit the student four or five courses of his own choice which may or may not have any particular relationship to the chosen major. The student in consultation with his adviser should make use of free electives to round out his educational program.

In reviewing the above six categories it should be noted that 50 percent of the student's time is allocated as a minimum for all students, and that 50 percent depends upon the student's choice of curriculum, major, and individual preference. Again it should be emphasized that these choices are subjective. But to many, this will appear as a good compromise, thus providing an opportunity to develop a reasonably well balanced program for the individual student. Minimum standards are protected and yet considerable freedom is permitted.

Philosophic Guides for Curricula Building

There are many things which are not necessarily a part of the curriculum which are important to the smooth and effective functioning of the educational program. In this section I discuss some of these briefly.

Providing for general education

There are many reasons why the general educational needs of the student should be constantly kept in mind. In the first place, most students are not sure what they will want to do when they finish college. In the second place, they are not sure what their needs will be in terms of train-

ing for future leadership and enlightened citizenship. In planning programs, the staff should be aware of the importance of a good general education regardless of the major interest of the individual student. The staff should keep in mind a behavioral pattern which it wants to develop in students and the kind of world in which it expects the student to live. Here again, this is subjective, but the staff will do a much better job of preparing students to deal with unknown future conditions if it recognizes some specific objectives.

Balance between applied and basic training

Most faculty members recognize that major colleges and universities were not established to provide vocational education. This is not to say that some applied training is not good. There is little debate over the two extremes. The real question is how much applied training and how much basic training should be included in the curriculum. If we lean heavily toward applied training, the student is probably better prepared for his first job. On the other hand, applied training may be out of date by the time the student has been on the job for a short while. In the long run, a basic understanding of principles may serve him better than simply knowing how to do things. Here again, the answer is subjective, but neither extreme appears to be the most desirable solution. My own personal opinion is that a student should have enough applied training so that he is able to secure a job and to be successful in his first employment. Beyond this, it would appear much better for the student to devote his time to basic training since it is felt that basic training will serve him over a much longer period of time than mere technology which may change from day to day.

A good advisory system is essential

The more freedom the student has the more important it is to have a good advisory system. Three things appear tremendously important in advising students. First, most students come from good homes and are adjusted to family life. When they come to college they are housed in large dormitories with many other boys and find it necessary to make considerable adjustment because of the differences between family living and living in a college dormitory. A good adviser can help the student to make this adjustment with a minimum of frustration.

Second, there is a considerable difference in the level of training given in high school and in college. This means the student is asked to adjust quickly from one level of instruction to another. This is a very difficult gap for many students to bridge. Here again the adviser can be quite helpful

to the student in making the adjustment to a new and higher level of instruction.

Third, the student needs some guidance in the selection of curriculum, majors, and even courses. Even though the student and the professor may have quite different sets of values, the professor has much more breadth of knowledge and should be able to help the student understand the alternatives that are available to him. A good adviser can help the student analyze his own problems, his likes and dislikes, and guide him into rational choices to meet his personal objectives.

A job is not enough

A good placement program is essential to round out the activities for which the university or school has responsibility. Being sure that the student gets a job is not enough. We should be sure that the student understands the opportunities available to him and that he has some choice. We should help him use his training to gain the kind of employment for which he is qualified. He should have an opportunity to render real service and to be happy. A good placement program should be regarded as an important adjunct to the educational program. If one is to recruit one must be able to place.

There is no substitute for good teachers

Thomas H. Huxley said, "I care not what subject is taught, if only it be taught well." There is a good deal of truth in this statement. Of course, I would not want to go so far as to substitute French for mathematics, but I would be quite willing to substitute one course for another within a reasonable range if by so doing I was able to bring a student in contact with an outstanding teacher.

John M. Mason said, "The aim of education should be to convert the mind into a living fountain and not a reservoir. That which is filled by merely pumping in will be emptied by pumping out." We should teach our students to think, not to imitate or to memorize. If the objective of college training is to affect the behavioral pattern of students after they have graduated and gone out into the world, then it seems obvious enough that we must prepare our students to think for themselves. The kind of decisions people make depend upon the values they hold dear and the information they have at their command.

GOALS OF UNDERGRADUATE INSTRUCTION IN AGRICULTURAL ECONOMICS

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TO ONE who considers teaching of students, both undergraduate and graduate, his major function, the decision of this Association to devote time to the discussion of the teaching function is very gratifying. A study of our Journal will indicate that of the trilogy of our major interests—teaching, research and extension—we have devoted very little space to teaching. This is true even though many of us will spend some time in front of the classroom. It also is in contrast to the American Economics Association which, over time, has shown considerable and continuing interest in its teaching problems.

Too often, as professionals, we become preoccupied with refining and specifying trivial propositions and problems. We become specialists in the details of the hog enterprise or how to load watermelons on a truck, but remain amateurs in the art of communicating the important contributions of our discipline to people. This tendency is probably due to our efforts to be "scholarly" and the belief that recognition comes only to those in research. The "popularizer" is often looked upon with disdain. In reality, the reward of appreciation of a generation of students who may be better citizens because of our efforts may be far more substantial than seeking the admiration of a few of our professional colleagues.

The Challenge of Economic Intelligence

We hear much that the world of tomorrow belongs to the engineer, the chemist or the physicist. We hear much of the need to keep technologically ahead of the Soviet Union. Without denying the importance of these disciplines or of the challenge, we must also remember that our goal is not to become like the Soviet Union. We are a democracy which puts great emphasis on the importance of individual freedom. We believe in ruling ourselves, not in being ruled. And in this most important of all human acts, the discipline of economics has much to offer. Citizens must be economically intelligent to operate and perpetuate our type of social and political organization. And as society increases in its technical and organizational complexity, to assure adequate intelligence is increasingly difficult.

In this problem setting, the situation is not encouraging. It has been estimated by the Committee for Economic Development that less than 5 percent of high school students receive anything which might be considered formal economic training. In addition, a Roper survey found that the

adult population ranked high school training in economics on par in importance with specialty subjects such as driver's training and other vocational and trade courses. Students then reach college with practically no prior economics training and little motivation to obtain such training. Even in colleges, however, the C.E.D. estimates that only 20-25 percent of the students receive training in economics.

In contrast to this, workers with agricultural students have a real opportunity. Cowden estimated that in 1951 the average land grant agricultural college student was required to take 6 to 9 hours of economics and agricultural economics.¹ The many excellent extension programs in farm management, marketing and policy indicate that farmers themselves are aware of the importance of economic understanding. Agricultural economics faculties are in a setting of great opportunities. The big question is how the many who come for two or three courses, as well as the relatively few who choose to major in the field and take five or ten courses, can be adequately serviced.

Scope of the Discussion

The following discussion shall be restricted to the goals and problems of the total economics training for these two groups of students. It shall refuse to give much attention to individual courses, for the particular content bundled up under a course title varies too greatly from institution to institution. It also will not recognize the boundaries between economics and agricultural economics. These arrangements also vary widely among institutions.

In the same vein the discussion will forego the currently popular pastime of discussing the agricultural business curriculum except to recognize that economics is a part, though certainly not all, of such specialty training. Finally, the discussion will not dwell upon particular teaching methods and procedures, though this is a subject near to every teacher's heart. These restrictions do not deny the great importance of individual course content, detailed curriculum development and effective teaching. Rather they are made so that attention can be focused on the issue of first importance: we must first agree upon what should be the goal of the student's total economics experience; we must first decide *what* we want to teach before we worry over the details of *where* and *how*.

The Goals of Education in Agricultural Economics

If practically all agricultural students are to be exposed to 6 or more hours of some kind of economics, and agricultural economics majors to

¹Cowden, T. K., "Teaching Economics in Agricultural Colleges in the United States," *Amer. Econ. Rev.*, May 1953, pp. 320-337.

much more, what should be the goal of this exposure? Two quick answers are often given to this question: the student should learn basic economic principles and he should learn how to think.

Upon reflection, however, neither of these answers really tells us much. Just what in economics are basic principles? And more importantly, if the student's time is the scarce resource, just which of these principles should we stress? This question of principles can become a very embarrassing one indeed. Chemistry books are in fair agreement as to the basic concepts and knowledge necessary to start handling the discipline. Physics books also are in substantial agreement. However, lay six texts in elementary economics side by side and then stare in wonderment at lack of agreement upon what are "basic economic principles"! In a curriculum workshop held in 1948 at New York University, leading economists when asked to provide a list of basic economic concepts which should be taught to all students could not all agree upon a single one which should be included. They were exceedingly critical of what was being taught, but could not agree on what *should be* universally taught.²

Also, the dictum that economics should "teach students to think" needs some clarification. Obviously this implies thinking in a peculiar or unique fashion, since obviously these young men can already think. The real implication is that they should be trained in the process of thinking economically; of developing economic rationality. Since economics is basically a system of abstract thought which permits the investigation of certain types of causal phenomena and their effects, it is training in this particular type of abstract thinking which is the goal.

Most observers agree that the effective functioning and continued existence of our society and political organization will depend upon an economically intelligent electorate. One has gone so far as to state that the ultimate function of economics and economists is to help people learn how to live in a free society and how to maintain and perhaps improve it.³ The important question, then, is what constitutes basic economic literacy and intelligence. This question was the subject of a research study which questioned a cross-section of 800 leaders in the fields of business, labor, agriculture and education. Replies were grouped and coded by professional economists, and then evaluated for their relative importance by a large panel of judges who not only represented various areas of special interest but also had considerable economic competence. The end product was some 88 individual economic topics ranked as to their importance.

² Learner, L. E., "A Brief History of Economics in General Education," in "The Teaching of Undergraduate Economics," *Amer. Econ. Rev.*, 40:5 Part 2 Supp., Dec. 1950, p. 33.

³ Overman, G. D., "Dynamic Concepts Everyone Should Know," South-Western Publishing Co., Mimeograph 95, 1954, p. 1.

The following five groupings indicate the content of the first fifteen of the economic topics judged essential:⁴

a) Foundations of capitalism such as private property, freedom of choice, profit motive, and competition; a comparison of capitalism with other organizational forms such as socialism and communism; the mixed nature of our economy—private enterprise and government, monopoly and competition, etc.

b) Production as the source of wealth, consumption as the motive for production; nature and role of factors of production; how prices of commodities and factors are determined—the elements of supply and demand.

c) Interdependence of people and groups, both domestically and foreign.

d) Changing levels of prices; money as compared with real incomes; government monetary and fiscal policies as they affect stability; taxation and revenue principles and implications.

e) Dynamic nature of productivity and the role of capital formation, savings and investment, research, industrial revolution, etc.

Here then is the high priority core which a cross-section of Americans tells us is necessary for the economically intelligent citizen. As one moves down the list of 88 topics, the special interest areas of agriculture, business and labor groups appear. The pertinent point, however, is that these specialty areas are considered subordinate to something more basic and important.

What are these people asking us to give our students? First, a broad understanding of the ethical and philosophical basis for our organizational system along with some grounds for judging and comparing its performance. Secondly, an elementary grounding in how the system operates along with the basic economic concepts for explaining this operation. They ask that the student not only know how and why the economic machinery works, but also what are the objectives and values for judging its performance. These requests reflect the thought of John Maurice Clark when he said that since economics is concerned with means and relative ratings of ends, ethics and economics are not separate worlds but rather that one is part of the other.⁵

As researchers, we have the luxury of concentrating largely on studying different causes and their effects and leaving it to others to judge which solution is best. As teachers we cannot have this simplifying luxury. Though we cannot judge for our students we must discuss the history and importance of various goals and values and how these are interwoven

⁴"Key Understandings in Economics," Council For Advancement of Secondary Education, Washington D.C., monograph, 1956.

⁵Clark, J. M., "Economics Means—To What Ends?" in "The Teaching of Undergraduate Economics," *Amer. Econ. Rev.*, 40:5 Part 2 Supp., Dec. 1950, p. 47.

into the way problems are solved. The average student, or citizen, is not interested in the elaborate theory of how the economic system works as an end in itself. This is a world of change and he wants to know how things can be improved or made better. Though these are messy and dangerous words, without considering them, classroom theory discussions fall on barren ground.

The central goal for the great group of students who come into contact with our subject matter for a limited amount of time is, in essence, what is the central theme of all economics. There are scarce means with which to get desired results; and therefore all phases of life are faced with how to allocate these means wisely and to the best advantage. This is economics; this is agricultural economics. This is central to a course in policy, in marketing, or in farm management. Students as they pass through each course, should see first and foremost the centrality of this issue; how it was handled and solved in the particular setting under discussion; and, most importantly, how the particular segment interrelates with the total economic structure.

If this goal is accepted, attention can then be turned to what are the truly basic ideas, concepts, and interrelationships which are essential to grasping and handling this theme. This becomes the problem of deciding what is necessary as an absolute minimum first, and then what elaboration is desirable if time and progress make it possible. Some examples of this sorting process might be given. Certainly, the concept of demand and its change is essential but probably not the elaboration of indifference curves. What tends to happen under conditions of less-than-perfect competition is basic, but probably not all the elaboration of various sub-forms of oligopoly. Or again, mastery of the basic scheme of supply analysis gets priority over discussion of the extreme difficulty and disagreements among various analysts of measuring the supply functions. This type of intellectual decision-making by the faculty, though admittedly extremely difficult, is necessary if our students are to complete their work with anything but a feeling that economics is extremely complicated and full of disagreements.

With those students who will spend more time with us, we can more fully develop the many variations and refinements of the basic propositions. We can elaborate more fully on different institutions, the development and the role they have played. We can treat in more detail the special issues and problems of agriculture. But here again, the major goal is the same. If a choice must be made between obtaining an economically literate citizen or learning the tricks of the trade of operating a farm or other business, universities must choose the former. Careful planning can make these two approaches compatible, but certainly

failure in general understanding can be far more costly than failure in vocational competence.

Accomplishing the Desired Results

Recognize lack of preparation

From a teaching viewpoint it is imperative to recognize the level of preparation and motivation of our students. Apparently the safest assumption here is that the majority have practically no knowledge of economics and little interest in it. Many students come to college with previous experiences in animal husbandry, agronomy—even chemistry and physics—but not in economics. This challenges the teacher to consciously establish the context, meaning and usefulness of each economic idea introduced. Over time, professional economists have developed a special language which to them has specific meaning and actually facilitates communication. But to students, this is literally a foreign language! Part of this terminology students, too, should learn to facilitate their thinking. But it must be consciously taught and continually practiced.

Early and continuous orientation

Special care must be taken to explain to the student the goal of his economic exposure and continually point out the relationship of the topic under discussion to that goal. Economics is an abstract science of significant relationships. As the student moves from course to course and area to area, unless we emphasize where these relationships fit into the total system, the total of this experience will simply be a large store of fragmentary and unrelated information and facts.

Perhaps it would be useful for each agricultural economics department to prepare a master chart of purposes, concepts and principles along with the relative role and place of all individual courses. Such effort, of course, should also seek the cooperation of the general economics department. This master plan would be helpful to instructors of individual courses in improving their contributions to the total program. It also should prove useful in orientation and planning work with students themselves.

The exact content of this master plan is not as important as that of getting the faculty to work together and prepare it, since without some faculty agreement as to the over-all objective and content of the curriculum, the result may be an assortment of quite excellent individual courses which will contribute useful knowledge to the student but not much organized understanding and progress toward the over-all goal.

Stimulate a broad training

Of all the various curricula in agriculture, agricultural economics has the best opportunity of insisting upon a broad training for its student. The discipline of economics is probably the least self-contained of all major subject areas. It depends upon the physical scientist to provide much of the materials for production economics. The relationship between economics and genetics, nutrition, soils and fertilization, etc., is close, and in general we do a good job of emphasizing this relationship. However, economics formulates behavioral relationships of people and their institutions. Basic, then, to a well-developed economic understanding are the humanities and social sciences such as psychology, sociology, history, political science, and philosophy. How much encouragement do we give our students to look into these areas? How much effort do we make toward integrating the contributions of these disciplines into our courses in economics?

Practice application of basic concepts

One common complaint among teachers is that the student can parrot back the principle or theory but he cannot apply it. We often excuse ourselves by saying that at least he knows the principle or theory, and as he grows older (and presumably wiser) he will learn to use it. One educator, at least, has challenged this assumption. He has raised the very disturbing question that if a student cannot see the use and application of principle and theory in the extremely favorable and simplified atmosphere of the classroom, can we realistically expect him to do so in the far more cluttered and complicated atmosphere of his adult life?⁶ If this is true, then, students toward the end of their college experience must be able to demonstrate that they can think with some proficiency of economic intelligence or the faculty has failed in its purpose.

Problem solving and thinking must be practiced by the student in the classroom. However, as every teacher knows, such activities are great consumers of classroom and paper-grading time. Since we already are short of time to present everything we think we should, the conclusion is obvious. Some content must be eliminated if time is to be obtained for this problem-solving practice.

The curriculum problem here is essentially the same as a special committee found in evaluating beginning courses in economics.⁷ It

⁶ Broudy, H. S., "Educational Theory and the Teaching of Economics," unpub. paper presented at Midwest Econ. Assoc., St. Louis, April 1959.

⁷ Hewitt, W. W., "Elementary Courses in Economics," in "The Teaching of Undergraduate Economics," *Amer. Econ. Rev.*, 40:5 Part 2 Supp., Dec. 1950, p. 56.

found these courses to be cluttered and too full of content and concluded that the number of objectives and content should be reduced. It pointed out that the fundamental error was *indecision* in what should be covered—when teachers were in doubt about the usefulness of an idea they tended to include it just to be safe. The committee's major conclusion for correction was that *we should make up our minds*. In our curriculum we must make up our minds what are the minimum essentials necessary in accomplishing our goal, then vigorously prune out other material to make time for the practice in the use and understanding of these essentials.

A major challenge which we as professionals face is to remember again and again that economics in its elementary sense is relatively simple. The purposes, underlying concepts and elementary theoretical framework are not complicated. The complications arise as all of the variants, exceptions and ramifications of the framework are explored. Our undergraduates, however, must be taught to walk before they can run. A vigorous grounding in the essentials is step one; the elaborations, and exceptions are step two. Such a development does not mean that we lower performance standards. Simplicity and rigor are compatible ideas.

It is in this area of communication and simplicity where teaching and research may be in conflict rather than harmony. As researchers, we are primarily interested in further specification and detail. We have become impressed with economic complication. But if we carry all of these elaborations into the classroom, we will succeed in sterilizing and beating to death a subject which should be vital and alive. Some of our colleagues have even gone so far as to propose that economic theory is so abstract and complicated that it should not be taught until the senior year—or perhaps not until the graduate level. Such an attitude is intolerable unless we are willing to pay the price of economic illiteracy of the average citizen. The extension service has not accepted this philosophy with adults; neither can the undergraduate teacher accept this philosophy with his students.

Arrange for the cumulative building progress

Both the students which we have in a service capacity and those who are agricultural economics majors should experience a feeling of growth and build-up as they take our several courses. Admittedly, the basic concepts will appear over and over. However, this should not be mere repetition, but a movement to a fuller understanding. Meat should be put on the bones.

This progression is a difficult assignment for a subject matter which has

had such a big job in persuading students to sample its offerings. Many agricultural economics departments have steered away from a prerequisite structure in course offerings and have made each course self-contained. The philosophy is that this flexibility of multiple offerings will attract more business and, after all "a little exposure to economics is better than none." The consequence often is that, even at senior levels, classes include some students who have had no economic preparation while others have had considerable. Instruction then usually gravitates to the lower levels. Such a situation, instead of treating all alike is being grossly unfair to the more advanced students.

This is not an argument for a rigid system of prerequisites so that all but agricultural economics majors are frozen out. Service to other areas still must be a major role. However, the other extreme of no progression is equally unacceptable. This means that the faculty in the preparation of its master framework must struggle to develop a dual system which will take each kind of student as far along as time permits.

Agriculture as a laboratory

Up to now, very little has been said about the separate role of agricultural economics. This has been intentional, for our first responsibility with agricultural students is to give them general economic understanding and literacy. In our classrooms we should be economists first, farm management, marketing and price specialists, second.

However, in our role of applied economists we have a wonderful opportunity. We can utilize the farm firm, agricultural marketing institutions, credit problems, pricing behavior and policy issues as a laboratory for practicing economic problem solving and reasoning. No other single industry offers such an array of opportunities. All shades of competitive structure are present. The farm firm offers an excellent laboratory for the problems of resource allocation. The policy issues are wonderful examples of the impossibility of separating ethics and values from economics. Here is the stage for bringing principle and theory out of the books and putting them into real life situations. This opportunity should be worked to the fullest. A by-product of this approach will be a more detailed understanding of the operation and issues of a particular segment of our economy. In this way, agricultural understanding becomes a very useful means to an end, but it must not become the end in itself.

Some Concluding Thoughts

This paper has intentionally stayed clear of the issues and problems of sub-specialty areas in agricultural economics. This does not mean that these are not matters worthy of discussion. It does imply a bias that our major responsibility to students during their college career is first to aid

them in becoming economically literate citizens and only secondarily to give them a vocational specialty.

Economic presentations must be simplified and clarified. Time must be found to help practice the use of economics. In most cases this is a faculty problem first—not a student or individual teacher issue. The emphasis has been on the goal of the total college experience in agricultural economics. As such, the teaching faculty must attempt some meeting of minds as to what is important and where it shall be covered.

Curricula work with individual courses as the building blocks will not meet this requirement. The building blocks are theoretical concepts, principles and ideas. All that we know is interesting and probably valuable to somebody, but not necessarily to our undergraduate. The problem is still best summed up by the committee studying elementary courses: we cover too much; indecision is our problem (when in doubt put it in!) and making up our minds will go a long way toward improving the situation.

As a faculty our purpose is somewhat different from that of an individual teacher. The faculty responsibility is the end product of the total college experience while a teacher may be concerned with the student's mastery of his own interest-area fragment.

Individual teachers must have great latitude and freedom in the development of individual courses. Successful experiences with courses which have been developed or taught by a committee or by outside dictation are rare indeed. This type of dictation is not being proposed here. However, the team approach has received great emphasis in research; extension programs are coordinated and planned. Most teachers should not object to organizing their efforts under some mutually agreed upon goals of operation. The end product is the human mind—and certainly this is important enough to demand our best efforts.

DISCUSSION: UNDERGRADUATE TRAINING IN AGRICULTURE

H. B. CLARK

University of Florida

I am in the amen corner concerning both papers and shall devote most of my time to emphasizing ideas made by each speaker. As a backdrop for my comments, I should like to list the following teaching principles, definitions or ideas I have found helpful which are fundamental and implicit in these two papers:

1. *Learning*—One learns when by his own doing (physical and mental) his behavior (acting, thinking and feeling) is changed. The important

thing is that the learner must be motivated properly. Motivation of the student can be found between the lines of both papers.

2. *Teaching*—Teaching is creating situations so as to get the changes in behavior of the learner which are *desired* by the teacher, or by the faculty in case of total college experience. Both papers stressed rightly the subjectivity of teaching and the responsibilities it places on teachers for re-appraising their goals and working harmoniously with one another and in furthering the aims of the university as a whole. The creation of learning situations is made easier because agriculture provides us with such a fine laboratory in which to work.

3. *Over-learning*—Over-learning (learning over and above that necessary when the learner is going to put that which is learned to immediate and continuous use) is required in teaching abstract subjects because much of what is learned is not put to immediate or continuous use. Over-learning is necessary if recall is to be rapid enough to permit pedagogical progress. This means that repetition has an important place and that, as Dr. Kohls says, a cumulative building program and practical application of principles is necessary.

4. *Unlearning*—Often the first step in teaching agricultural economics to undergraduates is to get them to unlearn much that they have learned as they have grown up in a rural environment. An appreciation of economics cannot be had if the student's attempt at abstract thinking is hampered by his partial knowledge of the real world. The idea which Dr. Jesness conveyed in the ditty, to the effect that the city boy could only open a book, while the country boy could go to the barn and take a look, sounds much better than it is. A few students are able to integrate the abstract with the practical and they do well in our discipline and make fine graduate students, but the bulk of the students find this task very difficult.

5. *Learning is tentative*—The average undergraduate wants quick and final answers to problems. If this is possible in the exact sciences, which I doubt, it certainly is not possible in the social sciences. The whole truth, even if known, cannot be taught at one time. So we teach the "simple truths" and then add to them the refinements, exceptions and applications. This brings us to problems of curriculum building, minimum standards and what to include at various levels, which both speakers have discussed.

Dean James' paper reflects the fact that he is an administrator (perhaps a little battle scarred) faced with the problems of modernizing the college of agriculture program to attract more students and indeed to train students for the opportunities which he envisions in his new concept of agriculture. The problem is getting the public to understand and to accept this new concept. The first thing we must do is to up-grade courses and instruction, and the second is to get prospective students, parents and

friends to realize that agriculture is a science requiring basic training on a par with that of other training. Dr. James' emphasis of basic training over applied training is correct. In this regard I quote from *The New York Times* of August 23, 1959, concerning changes to be made in West Point training:

More nuclear physics, electronics, chemistry studies of the effects of radiation; more time for the social sciences, and foreign languages, and strengthened instruction in the fundamentals of written and spoken English and in logic and research techniques are the changes to be instituted this fall.

The time required for these subjects will be made available by reducing time given in the past to "vocational" subjects—tactical instruction, military hygiene and physical education, or by shifting instruction in these subjects to the summer camp program.

Dr. James realizes that his goals are difficult to attain and that compromise is necessary. Yet he is optimistic that it can be done if administrators and faculty face the task with determination. Obviously some cherished ideas will have to go and perhaps some positions. His formula for attaining minimum levels of training and simultaneously providing for student freedom can only be criticized in matters of degree, not direction. His closing remarks about good teaching provide a fitting capstone to his paper. In our concern about the quality of our educational system in the light of the struggle with Soviet Russia, we must not subjugate the individual to the group (state) in our educational system. The tremendous inspiration of the good teacher for what he is as well as for what he knows is essential if the student is to learn to live in our society.

Professor Kohls confines his remarks largely to *what* should be included in teaching agricultural economics to undergraduates. He concludes, as does James, that basic economic literacy should be the goal. I particularly like his summary of this goal, which is to give students (1) a broad understanding of the ethical and philosophical foundations of our economic system, along with some basis for judging and comparing performance; and (2) an elementary grounding in how the system operates, along with basic concepts for explaining its operation. We must remember that students have a burning desire to try to improve things in general; hence, it is imperative that we teach them to be able to judge performance and to establish grounds for improvements.

I agree that the central theme of economics is the using of scarce means to get desired results and that economics is what we must teach first. I further believe that if this central theme is used at the very beginning, every student can become interested in economics in one class period. He suddenly realizes that he has been a practicing economist for several years.

Kohls reveals his teaching experience in his discussion of the lack of

preparation of the undergraduate. Perhaps the biggest mistake we teachers make is to fail to realize how little we knew at the undergraduate level and the bumps we had up the ladder of economic training. The matter of nomenclature is the biggest stumbling block. As trained economists, we have difficulty understanding one another because of words. When I was at the University of Kentucky, Professor Bradford and I started to make a list of words which we thought the beginning student should know. It ran into the hundreds. Furthermore, we do not use them properly ourselves much of the time. I suspect that language alone discourages more students than any other factor.

In considering *what* should be taught, Dr. Kohls rightly concludes that we try to teach too much. I am glad that he gets into the problem of *where* concepts should be taught as he does in his discussion of cumulative building. Also, he is correct when he states that it is the responsibility of the faculty to get together "to prepare a master chart of purposes, concepts and principles along with the relative role and place of all individual courses." I would emphasize that this must be done even if a little head-knocking is required. Sometimes I feel we teachers confuse abridgment of academic freedom with self-discipline and "university citizenship." Policies properly conceived with respect to *what* and *where* subject matter shall be taught are not an infringement of academic freedom.

Finally, although it was not the purpose of either speaker to consider *how* to implement the ideas expressed and how to improve teaching, this is quite as important and is worthy of consideration at the next annual meeting.

DISCUSSION: UNDERGRADUATE TRAINING IN AGRICULTURE

L. F. MILLER

Oklahoma State University

Director James and Professor Kohls have provided us with two excellent papers in an area which has received too little attention from our profession. I agree with their major propositions, and hence, will devote my time to points which I believe deserve emphasis and to other considerations which they purposely omitted from their papers.

In my judgment, schools of agriculture generally are not moving far enough or fast enough in the revision of their curriculums to meet the future needs of our students. New technology has been and will continue to be developed by our scientists at an increasing rate. If this view is correct, it has two important implications for our educational programs.

The first implication is that we must place a high rate of depreciation on

present "know-how." It will not be worth much five years from now. Since we are training our students for a lifetime of productive effort, just how much of our students' time can we afford to spend teaching today's improved practices?

The second important implication of this trend is that we must provide our agricultural students with a better foundation in scientific fundamentals which will permit them to understand and use this new technology. This means placing considerably more emphasis on the so-called basic sciences such as physics, chemistry, biology, nutrition, mathematics and genetics. Such increased emphasis on basic sciences would be at the expense of the more strictly applied courses which are built largely on production and economic practices that may be out of date in a few years. I am not suggesting this would prove popular with our students, but I would rather have a few unhappy students today than a future generation of poorly equipped agriculturalists.

Dr. James stresses the need for so-called basic training rather than so much emphasis on applied courses. His position is that a student should have enough applied training to secure a job and to be successful in his first employment. I wish Dr. James had elaborated on just how much applied training he believes would meet this objective. With the trend towards employer offerings of substantial training programs for college graduates, we probably could go considerably further in this direction than is generally done at present. My guess is that Dr. James may feel the same way, since his minimum requirements by areas do not appear to make provision for the traditional survey courses offered by most departments in our schools of agriculture.

It is a generally accepted statement that our social and economic problems will become more complex and more pressing, not only in agriculture but in our economy generally. Dr. James' minimum requirements would allot 20 percent of the student's total college credit hours to the social sciences and humanities. Such a standard would go far toward correcting one of the serious deficiencies of many present day agricultural graduates. I wish Dr. James had attempted a rough analysis of the current requirements of several schools of agriculture in relation to the model he has constructed. In the cases of social sciences and humanities, I believe many schools of agriculture would fall considerably short of his minimum standard. At Oklahoma State, for example, no work in humanities is required by the College of Agriculture, and less than 10 percent of the students' semester hours are required in the social sciences.

Professor Kohls' paper offers a strong challenge to all of us concerned with teaching agricultural economics. As he says, we need to make up our minds as to the minimum essentials necessary to accomplish our goals and then vigorously prune out other material to give students time to gain

experience in the use and understanding of these essentials. Our staff at Oklahoma is especially concerned about the difficulty experienced by our students, both undergraduate and graduate, in integrating and applying their economic principles to the solution of real world problems. We have arrived at Professor Kohls' conclusion that the only answer is to provide more opportunity in our classrooms for students to make such applications.

Another problem with which we are concerned is that students may wrongly conclude that basic principles taught in beginning economics are simply being duplicated in subsequent courses. As Professor Kohls suggests, it probably would be useful for each agricultural economics department to prepare a master outline of purposes, concepts, and principles along with the relative role and place of each individual course. We must be sure that our courses build on each other, and that our students understand and appreciate the building process so they graduate with a well-founded enthusiasm for the teaching program in their department.

A point of general interest at this time which was only touched on by your principal speakers is the so-called "business option" in agriculture. There is no doubt in my mind that the recent move in this direction was overdue. I have some fear, however, that our students will find the training they receive in this connection inadequate for their needs in 1975, when they hope to be in responsible management positions. If we are really serious about preparing our students for management positions in agribusiness, I believe we must be especially concerned about giving our students a broad, fundamental training with particular emphasis on adequate background in the social sciences, humanities, mathematics, and numerical analysis.

Leading schools of business appear to be moving strongly in the direction of less-specialized training, according to a recent article in *Business Week* on "Seasoning B-Schools with a Dash of Liberal Arts."

Nearly all these schools are in the grip of changing times. Curriculums are being revised. Old courses are being dropped, new ones are being added. New teaching methods are being introduced. Basic philosophies are being thrown out. And everywhere the emphasis is switching from concentration on subjects pertaining strictly to business, to studies of a definitely broader interest.¹

Unless our students in agriculture receive a similar broad background, they are going to be at a distinct disadvantage in competing with business school graduates for tomorrow's management positions in agribusiness. Our students in schools of agriculture will have the advantage of understanding farming and related industries, but this alone is not enough.

Those of us who are concerned with agribusiness training would do

¹ "Seasoning B-Schools with a Dash of Liberal Arts," *Business Week*, July 18, 1959, p. 112.

well to heed the thinking of Dr. G. L. Bach, Dean of the Graduate School of Industrial Administration at the Carnegie Institute of Technology.

Given the certainty of change and the uncertainty as to its direction and outcome, it seems to be clear that we must place central importance in our university training—for business as elsewhere—on students' thought processes and not on particularized subject matter. In such a world, surely anything we can do to develop flexibility of mind, openness and receptivity to new and changing ideas, habitual skills in learning for one's self, and other such mental characteristics must promise more use to the individual and to society over the quarter century of change ahead, than would comparable attention to descriptive information about today's institutions and today's best business practice.²

A minor question in connection with agribusiness options is whether departments of agricultural economics will find it necessary to introduce at least one new course in agricultural business management. It is questionable whether we can depend upon general management courses in our business schools to provide training as good as from courses we could teach in agricultural economics based on our research with agricultural marketing and farm supply firms. A recent survey by Professor Gunn, Washington State University, indicates that 14 departments of agricultural economics are now offering a course in this general area.³

My final point, to which I believe we should give earnest attention, is the overall declining enrollment in schools of agriculture. While enrollments in agricultural economics have been holding up well or increasing, we cannot help but be seriously influenced by the down trend in agricultural enrollments. For the United States as a whole, enrollment has dropped from a total of 45,853 students in 1948 to 32,499 in 1958. A straight line projection of this trend would reach zero in 1982. At Oklahoma State our enrollment in the College of Agriculture has declined from 2,135 in 1949 to 1,033 in 1958. Excellent curriculums, course contents, and teaching methods will be of little help in empty classrooms. Decline in enrollments probably is a reflection on our curriculums and on our slow adjustment to changing times, but it is much more than this. The real bottleneck seems to be at the high school counseling and advisement level where agriculture still means farming. This fact, combined with the well-publicized glamour in other areas, presents a serious, if not alarming, situation. Somehow, we must break through to our high school seniors to give them a realistic picture of the opportunities in agribusiness and agricultural science if agriculture is to avoid a distinct shortage of competent future leaders.

²Bach, G. L., "Observations on the Business School of Tomorrow," *Management Science*, July, 1958, p. 352.

³Gunn, Thomas I., "Teaching Programs in Agricultural Business Management," contributed paper, Western Farm Econ. Assoc. meeting, July, 1959.

MANAGEMENT ORIENTATION OF EXTENSION

Chairman: John C. Doneth, Michigan State University

GIVING A MANAGEMENT ORIENTATION TO EXTENSION WORK

MOYLE S. WILLIAMS
National Plant Food Institute

THE pressure of rapidly changing conditions and demands has never been greater than today for shifting programs and methods of Extension.¹ The relevant question is not whether Extension should change but whether needed changes can be made fast enough for Extension to maintain its dominant role as the adult educational agency for agriculture.

One of the distinguishing characteristics of Agricultural Extension work has been its flexibility. As the size of the state services has increased and particularly as the groups of various subject-matter specialists have grown in size and influence, indications of institutional rigidities have become evident. The somewhat paradoxical development has been a tremendous widening of the programs and activities, indicating increased flexibility, along with an increasingly evident vested interest in existing programs and projects. Historically, Extension has added programs but much less frequently terminated any activities.

"Reorientation" of Extension work in the past often has meant the addition of programs on top of those already in existence, rather than changing direction, either of programs or of methods. The latest examples are the additions of the Farm and Home Development and the Rural Development programs.² In most cases, these programs have been added with little evidence of the discontinuance of activities or significant changes in Extension methods existing prior to their appearance.

The thesis of this paper is that such an approach to reorienting Extension work to meet the demands of the day has not worked very satisfactorily and that a more fundamental approach must be adopted if Extension is to meet its responsibility.

Need for a Change

The tremendous changes in agriculture in recent years are well known to economists and most others interested in agriculture. They need not

¹ Extension, as used in this paper, refers to the Agricultural Extension Service.

² Program projection is an encouraging exception. Apparently, program projection has been accepted more as a method than a program. Many knew the techniques involved as "program planning." Still, it is possible that this concept has done more toward reorienting Extension than Farm and Home Development and Rural Development combined.

be repeated here except to say that these changes make the job of farming increasingly complex and success in farming hinges increasingly on management ability. To indicate the framework for this paper, the changes referred to include those in methods of agricultural production, in the characteristics of farmers, in the rural environment, and in the whole structure of the agricultural sector. A basic assumption of this presentation is that it is generally accepted that the changes in agriculture must be accompanied by changes in the programs of those organizations serving agriculture.

The need for adapting to changing times is recognized by leaders in Extension. The *Scope* Report indicates this in a number of ways. "One consistent characteristic of Extension work has been the necessity to shift programs and methods to meet ever-changing conditions and demands."³ The report recognizes the need for the Extension Service to adapt its programs to "the rapidly changing scene."

The *Scope* Report includes nine major areas which should receive high-priority attention and indicates that Extension should accept a much broader area of responsibility in the future. This seems realistic and appropriate. Yet Extension has grown on the basis of its value to farm families and the core of its support continues to be farmers and farm organizations. My personal opinion is that the major problems Extension will face over the next few years are associated with continuing its educational service for the family-operated commercial farms and the supporting commercial firms.

This is not to disparage the educational needs of non-farm people, rural youth, and the other growing needs for Extension work. It is to state a belief that the future of Extension is more dependent on adjusting to the needs of commercial agriculture than anything else. The necessity to shift is greatest in the strong agricultural states. Also, it is doubtful if Extension can expand several phases of its work and contract none of them, unless unanticipated funds become available.

So we conclude, in line with one of the basic philosophical concepts of the American society, change is needed.

Management Orientation

To advocate "giving a management orientation to Extension work" requires some explanation of what the term "management orientation" implies. This in turn forces a consideration of the concept of management.

The position that economic theory is synonymous with the theory of management seems to be the private property of economists, and not even

³ *The Cooperative Extension Service Today, A Statement of Scope and Responsibility*, Fed. Ext. Serv., USDA, April 1958, p. 5.

all economists accept this interpretation. Glenn Johnson has presented the argument that management is much broader than economics:⁴

Management is essentially human behavior. As human behavior depends on the subject matter of all the sciences and all of the humanities, attempts to restrict the study of management as a subfield or to any one of the sciences or humanities eliminate important elements from consideration. Farm management is far broader than economics. It extends from deep in the physical sciences on one hand to deep in philosophic value theory and ethics on the other.

Management is both an art and a science. The science of management is the body of knowledge about how human and material resources can be combined and employed to achieve ends or goals. The art of management implies the creative and skillful application or adaptation of this knowledge. In this context, it becomes somewhat academic whether economics provides the theory and principles on which management rests. It is important that the interpretation be broad enough to emphasize understanding human behavior as one of the fundamental aspects.

Generally, management is considered to be an applied science from many disciplines. This connotation applies to the application of knowledge, or the art of management as defined above.

The conclusion for purposes of this paper is that management orientation of Extension work means to conduct it so as to intelligently guide human behavior in the application of such knowledge as is available. If a change is needed, the shift in emphasis needed is to stress human resources. Management orientation suggests the application of knowledge, rather than disciplines, to help the recipients (farmers, consumers, or whomever) to survive more harmoniously in their present and, insofar as possible, their anticipated environment. This includes the provision of information and ideas which could be used to influence the environment. When so broadly defined, management orientation is a theoretically acceptable concept but one whose application becomes an operational difficulty of great magnitude, at least as far as Extension is concerned.

This broad view of the management function has the advantage of not tying it to any one discipline and hence placing it squarely upon the shoulders of the Extension administration. However, its advantage is also its weakness, especially for an organization such as Extension that is concerned primarily with the application of knowledge.

In the first place, Extension administrators generally have not shown an inclination to assume this sort of role. Secondly, by being divorced from the disciplines, management has no home and may well become a starving orphan. Hence, in view of institutional realities and practical

⁴ Glenn L. Johnson, "The Role of Management in Planning Farms for Optimum Fertilizer Use," *Economic and Technical Analysis of Fertilizer Innovations and Resource Use*, Ames, The Iowa State College Press, 1957, Chap. 22, p. 270.

problems of use, a restricted and more operational view has been, and of necessity will be, accepted by Extension. The accepted definition appears to be that management is decision making.⁵

The management education goal of the Extension Service is to help people improve their ability to make decisions that achieve goals with the most efficient expenditure of resources. This involves providing information which is relevant to understanding alternatives, developing the ability to visualize a wider range of alternatives, and teaching the principles used in accurately analyzing the consequences of alternatives in terms of reaching desired goals.

For practical purposes, this is a very satisfactory definition. The management approach to Extension then becomes that of problem solving within the means-end schema. It means approaching questions and problems within an economic framework.

This places the Extension economist in a position to exert tremendous influence over the direction Extension takes. The science of economics and its application should cut across the whole field of agricultural and social sciences. Someone has to assume the leadership in changing Extension's methods and philosophy. This role falls to the economist, if for no other reason than by default.⁶

This is not a new responsibility for the economist. But the record of performance must improve in the future if Extension is to become really management oriented.

One requirement for improved performance is that economists in this Extension role must become broader in their interests, knowledge, and perceptions. They must have a broad, rather than a narrow, concept of economics—of what it encompasses and of its role in human lives. Their curiosity, interests, and concerns must extend from deep in the physical sciences to deep in philosophic values and ethics. The farm management worker must learn to be fully aware of the non-monetary, as well as the monetary, motivations and goals of the farmer and his family—and of the conflicts and compromises between them. Without this awareness he cannot be a really good Extension farm management specialist, much less lead the Extension Service in developing a management orientation.

Giving Management Orientation

As stated earlier, the thesis of this paper is that Extension must make some basic changes if its efforts are to be more management oriented.

⁵"Management on the Farm and in the Home," Sect. IV in *A Guide to Extension Programs for the Future*, Extension Committee on Organization and Policy, printed by N. C. State Coll.

⁶This is not to argue that other social and behavior scientists are not as well qualified by training and experience. It is simply that few of the state Extension Services have such people on their staff. They do employ economists.

The changing role of Extension centers on the activities and programs of the county agent and the county staff. Since the passage of the Smith-Lever Act, the county agent has been the key figure. His role has been predominant and the Extension Service has grown because of his effectiveness.

In 1959, the county agent is faced with an almost impossible job. He is expected to be the technical expert on all phases of agricultural production and marketing, to be a community development authority, to be the local public relations arm of the college, to participate in and be a part of community affairs, to be a management counselor, and on and on. For all of this, he is rewarded with heartfelt thanks, a large psychic income, and a salary commensurate with that of a fair plumber or electrician.

If the county Extension staff is expected, and tries, to be all things to all people, Extension can look forward to a future of mediocrity and waning influence.⁷ Extension has certain inherent advantages which should be built on, rather than trying to do a little of everything for everybody.

The one place that Extension has an unchallenged role in the agricultural field is that of coordinating information into an integrated whole—that of “management orientation.”

Most of the supply and marketing firms servicing agriculture are providing informational services along with their products and other services. The quantity and quality of technology from these sources are increasing. Part of this is associated with the integrated agricultural industries, such as the broiler industry. In this industry, the representatives of the feed companies, poultry processors, and other commercial concerns who act as farm advisors are generally competent and well-trained technicians. Any county agent who maintains the same level of technical competence on such subjects as poultry nutrition or disease control will have to devote a relatively large amount of his time to these subjects.⁸

Likewise, fertilizer companies and other factor suppliers are adding well-trained technicians to their staff to help farmers develop their production plans and put these plans into effect.

In fact, preliminary results of a study by the Department of Education

⁷ This is not to argue that the county program should not be broadened, nor recognition given to changing demands, such as those of non-farm rural residents. It is my contention that it is extremely difficult for any county staff to be competent in all areas where assistance may be requested—and over the long run there is no substitute for competence. Many counties have added specialists to county staffs, with varying degrees of success.

⁸ Actually this development is tending to force county agents into the management approach. A county agent in North Carolina in an important poultry county says the questions he gets now are almost all on management problems. Ten years ago, they were almost all concerned with technology per se.

of the University of California at Davis indicate that many California farmers are turning over the decisions relating to fertilizer use to their dealers. The farmer in such cases no longer tries to keep up with the latest developments. He buys this knowledge along with his fertilizer from a person in whom he has confidence. Apparently, most are satisfied with the results.

This may be an extreme example but it is indicative of the changing role of the county agent. He may no longer be expected to be the technical expert. Yet, few of the commercial representatives are helping farmers with their over-all management program of what to produce, when to sell, and the multitude of other decisions the farmer must make. This is the role that Extension should assume and must assume for self-preservation.

The job of providing technical information is increasingly being assumed by commercial representatives and others. The specialist role in providing much of this technical information seems to me rather clear. But the role of the county agent is much in doubt, if he continues to try to be the source of all technical information. I for one believe it is almost impossible for the average county agent to keep up, and still do the other things expected of him.

As I see the changing situation, more and more of the results of research, both public and private, will be conveyed to farmers by sources other than the county agent.⁹ Extension will still have a role to try to insure that the information used by others is as factual as possible. But the commercial specialist, whether he be with a fertilizer company, farm magazine, radio, or some other organization, will be increasingly important as an information source.

Yet, few, if any, of these company representatives by interest, direction, or training are competent to deal with the management problem of "fitting things together." My argument is that this is where Extension has a distinct advantage and should excel.¹⁰

Over the past five years, Extension has had a wonderful opportunity to give a management orientation to its programs. Farm and home development, with the accompanying increase in funds, supposedly was to be the means. I have been disappointed in how little seems to have been accomplished in this direction. Progress has been made and is to be

⁹ Developments in research may well have a similar impact on the college experiment stations, i.e., more of the so-called applied research is being done by private firms.

¹⁰ As shown in a study of commercial cotton farmers' attitudes toward Extension, by Win Lawson of the California Agricultural Extension Service, farmers want the Extension Service to continue to help them solve their immediate problems. This provides an excellent teaching situation.

applauded. But changes in agriculture have moved more rapidly than changes in Extension. It seems that, belatedly, there is a growing understanding of the adjustments in methods and programs that must be made, especially by Extension administrators.¹¹

Who and How

In the very real world in which Extension functions, someone has to sell the management approach to the large majority of Extension workers who do not see, understand, nor appreciate its importance. As argued earlier, a broad concept of management puts this responsibility on the administrators. A number of economists recently have moved into administrative positions and should have a management orientation.¹² But some directors and many assistant directors and district supervisors remain to be convinced. The first need is the training of administrators in the management approach. The logical, and usually the only, person to sell this idea is the economist.

The Federal Extension Service, through its contact with, and acceptance by, directors can help speed up the process of adoption.¹³ The "bottleneck" most often is at the second echelon of administration—the district agents or supervisors and the project leaders. Once again it appears the economist must do the convincing, or at least find a few innovators.

As long as Extension places emphasis on subject-matter areas, any realistic specialist is going to push his own field. Many feel very keenly the competition from the farm management specialist and are not going to willingly abdicate. For a project leader to willingly relinquish some of his funds to expand work in what he considers a competing discipline happens infrequently.

While the burden of the responsibility is on the Extension economist, his colleagues in teaching and research have not universally forwarded the movement of Extension toward a management approach.

Trained and intelligent personnel is essential—and one of the problems in Farm and Home Development has been finding people trained in management who wanted to work in Extension. Most of the trained agricultural economists, especially with graduate training, are going into areas

¹¹ My Extension friends tell me that Extension has become more conscious of management, both as applied to Extension operations and to its programs with farmers and others. Recognizing that such developments tend to progress slowly in the early stages, there is little evidence of this change to an outsider.

¹² It will be interesting to observe whether these economists can change their environment or whether some may be forced to adapt to the existing environment.

¹³ The revision of Extension project agreements and annual plans of work and reports is a step toward over-all program integration and between-staff coordination. In essence, the proposal would consolidate the average of 23 project agreements per state into 7 basic work projects. It should make a real contribution.

other than Extension. Part of this can be explained by salary differences and other measurable factors. At least part of this development has been due to the orientation and philosophy passed on by teachers. Many well-trained economists would now be in leadership positions had they gone into Extension. No doubt, Extension would have moved much closer to the management approach had this happened. Their absence has accounted, at least in part, for the present stress on technical information. Of the departments who have had large numbers of graduate students in recent years, how many have gone into Extension? There continues to be a large gap between Extension and research and teaching. As long as students are impressed with the loftiness of research as a most respectable occupation, and at least by inference led to believe that Extension may not be on quite the same level, Extension will continue to have difficulty in attracting economists.

The conclusion that I reach is that Extension economists, and primarily farm management specialists, must sell the management approach if Extension is to move in this direction. They have to convince the administrative group, especially district supervisors and other specialists, that the management approach will make their work more effective and reward them both personally and professionally. Some excellent examples of such convincing in recent years could be cited. They reflect credit and gain to both the "buyer" and "seller" and to the Extension Service. The program projection activity may help build local support for the problem-solving approach if the philosophy of problem solving is injected into it with enough competence and with enough of its natural appeal to the common sense of county Extension agents and lay leaders.

Perhaps program projection on a state-wide or area basis and by agricultural industries is needed to supplement that done on a county basis. Such program projection is one of the good places for the commodity specialist to develop a management orientation to his work. The economist can contribute to this development if he is competent enough as an economist and skillful enough as an educator.

Extension administrators have a problem common to all leaders—they dare not get too far ahead of those they want to lead, lest they lose their value as leaders. It is easy to be critical of the slowness of change and to blame the directors. Yet they have responded to change as fast as they could get Extension workers to change.

New programs will not in themselves result in management orientation. Unless someone works at changing attitudes and philosophies of key Extension personnel, Extension will continue to value the enterprise and practice approach and will try to compete as technologists. That someone has to be the economist.

Finally, moving more to the management approach will not be the millennium. The pursuit of knowledge creates problems as surely as it solves them. The administrator's job will be much more difficult. It is about time Extension began to devote enough of its resources to management within the organization itself. This would contribute much toward making the Extension Service more management oriented—and better managed.

DISCUSSION: GIVING A MANAGEMENT ORIENTATION TO EXTENSION WORK

ARTHUR W. PETERSON
Washington State University

Dr. Williams presents a point of view on "management orientation to Extension work" typical of many Farm Management Specialists. He suggests that:

1. there is a need for increased emphasis on management, especially Farm Management, for commercial agriculture;
2. the need for adapting to changes in our agriculture and social needs in general is recognized by Extension leaders;
3. the record of actual accomplishments to date is disappointing although progress has been made;
4. the Agricultural Extension Service at the county program level has a unique opportunity to deal with the management problem of "fitting things together";
5. the final responsibility for program changes rests with Directors and other administrators, but the selling of the management concept to them rests on the shoulders of the agricultural economists.

Dr. Williams' proposed solutions include:

1. more training of administrators in the management approach;
2. a change in Extension project agreements and annual plans of work from a large number of subject matter project agreements to fewer basic work project agreements;
3. a change in the orientation and philosophy of teachers in Agricultural Economics as they train graduate students from placing emphasis on "recognition in research" to placing emphasis on "opportunities in Extension";
4. Program Projection as a problem-solving approach on a county, area, and state-wide basis offers a good place for the commodity specialist to develop a management orientation to his work.

The Sociologists' Contribution to Management Orientation

Dr. Williams accepts the concept that management is broader than the application of the science of economics. He says, "If a change is needed, the shift in emphasis needed is to stress human resources."

"The farm management worker must learn to be fully aware of the non-monetary as well as the monetary motivations and goals of the farmer and his family—and of the conflicts and compromises between them." If this is true, and my own experience leads me to believe that it is, then the farm management specialists need to join forces with other social scientists in order to understand and bring about this change in the Extension Service. Dr. Williams passes over this possibility lightly by suggesting in a footnote that social behavioral scientists may be as well qualified by training as the economists, but "few Extension Services have such people on their staff." If Extension administrators accept this point of view, they will also hesitate to add Farm Management Specialists to the staff because at present most Extension staffs have many more Production than Agricultural Economic specialists.

In recent years, the human behavioral scientists have contributed to change in Extension concepts and programs way out of proportion to their numbers. The most important impact on the Agricultural Extension Service of Washington State University in the last two years has been the "communication workshops" we have held for every member of our staff. The research background information and interpretation for these workshops were developed by sociologists.

Experience with "Management Orientation" Through Farm and Home Planning (Development)

If we had understood the "Social Action Process" when we started Farm and Home Planning (Development) in Washington in 1953-54, we would have proceeded differently. Our Director at the time was a former Farm Management Specialist. He and I thought the need for improved management by families was great and that all we had to do was give county agents some training and "launch" the program. We didn't take time to: (1) study our social system or prior social situation; (2) identify carefully Extension's goals for Farm and Home Planning; (3) check the concepts of Farm and Home Planning with legitimizers within and outside Extension; (4) initiate the idea with leaders within Extension; (5) analyze our problems of time, need for training aids, etc.; and (6) outline and get acceptance within the Extension staff and among our lay leaders of program objectives for Farm and Home Planning. We had very little understanding of how people, including Extension workers, "accept new ideas." We wanted, or said we did, Farm and Home Planning to become

an *Extension method* for increasing the management orientation of the Extension program with families. Most of the other Extension specialists regarded Farm and Home Planning as a *project* of the economists.

In 1953, I was not aware of the research findings of sociologists which could have helped us understand the "diffusion process" and the slowness with which a complex idea like Farm and Home Planning could be expected to take hold. Fortunately, I was in close communication with our rural sociologists and with experienced Extension workers on our staff. The latter had a "feeling for the communication process" with families from long experience. Our efforts in Farm and Home Planning, therefore, recognized many of the principles of "how to work with people." We accepted the family rather than the operator as the decision making body and built our methods of teaching management around principles which still seem sound in the light of findings of workers in the behavioral sciences. Most of our mistakes in getting understanding and acceptance of Farm and Home Planning seem, in retrospect, to have been made within our own staff.

It is my observation that in many other States, especially where the Departments of Agricultural Economics are strong, Farm and Home Planning (Development) is more of a Farm Management project than an Extension method for teaching the management process to families.

Shouldn't Extension administrators ask questions such as these if they want to increase the management orientation within Extension?

1. Should Farm Management Specialists broaden their concepts of management to include the contributions of research from the Sociologists?
2. Should Rural Sociologists be added to the staff to work with the Agricultural Economists in getting more management orientation in the Extension program?

As a case in point, I wonder how many in attendance at this meeting have reviewed the papers read before the annual meeting of the Rural Sociological Society at Pullman, Washington, in August 1958, entitled "Research Clinic on Decision Making."

My conclusion differs from Dr. Williams' in this respect—I think the experience of Extension shows at least as great a need for adding Rural Sociologists to our staffs as Agricultural Economists if we want more of "a management orientation" in Extension work.

Other Areas Where Extension Can Use the Management Process

There are several other areas where Extension can give a "Management Orientation to Extension Work." Dr. Williams suggests that "it is about time Extension began to devote enough of its resources to manage-

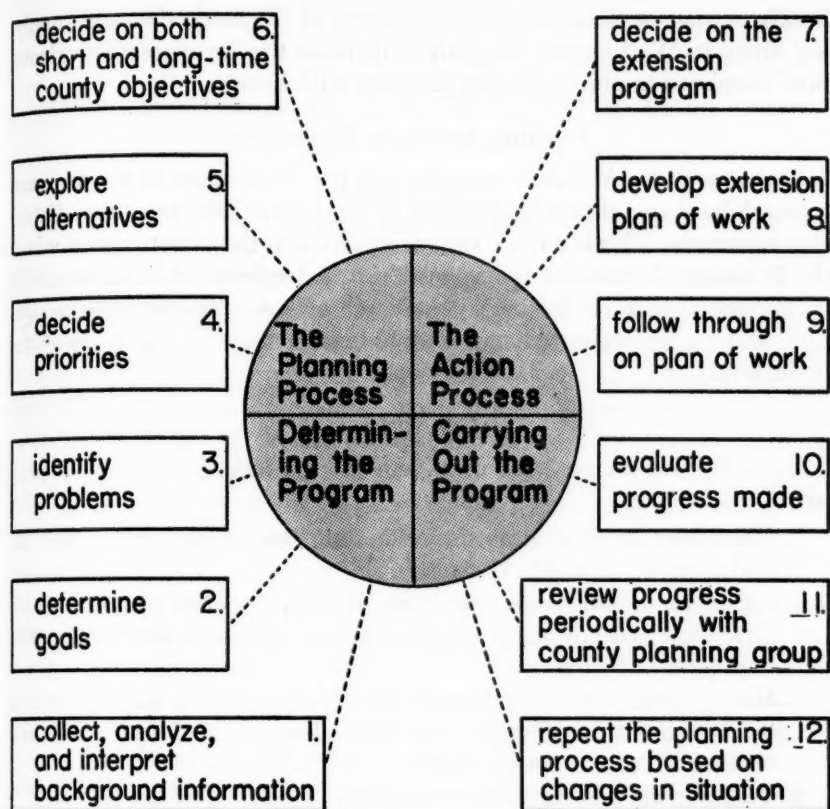


FIGURE III. COUNTY PROGRAM DEVELOPMENT

ment within the organization itself." One possible way to do this is through Program Projection. Program Projection should be to Extension what Farm and Home Planning is to a family.

In Washington, the supervisors of county agents have prepared a Program Projection Manual in which the planning and carrying out of an Extension program is tied to the "management process." Figure III from the Washington Program Projection Manual, page B-3, illustrates how the supervisors visualize the management process in County Program Development (see figure). Program projection provides the opportunity for a social or political group like a community or a county to apply the management process to their resources to achieve their goals.

Several state Extension services have included the teaching of the management process in their program with marketing and supplying firms. This is another application of the management process similar to Farm and Home Planning with the decision making group changed from the

family to managers and boards of directors of the marketing and supply firms. In Washington, we plan to increase the "management orientation" emphasis in our marketing program with firms.

Training Extension Economists

I agree with Dr. Williams when he says that economists in teaching and research have not always understood or appreciated the role of an Extension economist. This is a more serious situation at those institutions where the Extension Economist is responsible to a Department Chairman who is "impressed with the loftiness of research as a most respectable occupation, and by inference believes that Extension may not be quite at the same level."

Conclusions

Extension can increase the management orientation to Extension work by:

1. Extension administrators understanding the "social action process" and applying it within Extension.
2. Extension administrators applying "the management process" within Extension and encouraging its use by all Extension workers in their own jobs.
3. Hiring more specialists trained in sociology and management and by broadening the training in these disciplines of specialists and other workers now on the staff.
4. Teaching the management process to:
 - a. families—farm, part-time farm and non-farm families.
 - b. managers and boards of directors of marketing and supply firms.
 - c. communities, interest and other groups as a part of Program Projection.
 - d. leaders in public affairs.

ADJUSTMENT NEEDED IN EXTENSION THINKING AND ORGANIZATION

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THREE terms dominate the contemporary conversation about Cooperative Agricultural Extension Work. The first is change. The second is the future. The third is adjustment. No conference devoted to the Extension enterprise is apparently legitimate unless the welcome address depicts the challenge of change, the mid-point papers portray the inscrutable mysteries of the future, and the farewell remarks conjure up some route into the uncertain mists ahead. These are the surface symptoms of the very considerable adrenalin still remaining in a venerable and scarred veteran of the social, economic, and political evolution of an industrial society.

But indeed, such terms and themes constitute only the surface symptoms. Those which call for a deeper diagnosis lie at the center of the Extension System: its point of view, its desire for confronting reality, and its courage for experimentation. The Extension worker is notably lively toward the conference theme when he is abroad. But the Extension System is notably resilient toward its application at home. Accordingly, the present remarks will not deliberately depict the element of change, identify tomorrow's mysteries, or suggest the sacred road to Jerusalem. Instead, these remarks shall advance a few notions which strike the author as centrally important for the Extension System if it is to be uniquely useful in a society no longer lacking in an abundance of information and the media for its diffusion. All American institutions are increasingly penetrated by scintillating change, which blurs their aims. The precept to be vigilantly remembered is that the Extension System is not alone in a surveillance of philosophic stance; and, just as importantly, it cannot be excused. It must continuously accommodate, roll with the punches, and discover and feel comfortable with the shades of grey which are generated by the persuasions of exact technology and inexact policies. The alternative to this is distraction, then aimlessness, then a virtuous quest for self-perpetuation, and on through the sectors of demise which human institutions may confront in their own life histories. But unlike the humans who staff them, institutions may escape such sectors of demise. With this, the paper proceeds to three essential notions: the *product* of Extension work; the question of *orientation*; and the *university* as one sector of Extension's external environment.

I. The Product

It has been my own recent contention that Extension work emerged through two dominant chapters. The first was the chapter of itinerant philosophy and demonstration. The second found its focus in the thirties as the chapter of organizational custodianship. The current debate is shaping what the third chapter will become. Certain dualities prolong the debate: service or education; a clientele or problem approach; the transmission of information or the teaching of alternatives; and formality or informality in the organization of educational experience. These combine into a more general and deeper question: Is the Extension System to become an agency of service or an institution of education?

As we have already come to realize, the industrializing community is an intricate network of agencies and services. Such agencies, and the services which they dispense, seem to cluster more and more about the central pivots of power—government, business, labor and agriculture. Social, economic, and political issues become interlaced with agency allegiances, which, in their own turn, call forth still further multiplications of allegiances. This context is shot through with tension and therefore a motivation for change—usually appraised as a desirable component of American values. Nevertheless, considerable difficulty lies in coalescing American values when they are confronted with fractionated commitments, halfway solutions, and intersecting interests.

Within this web of agencies and services, the contemporary distraction which characterizes the Extension System—as it does the agricultural colleges and rural life in general—stems from the no-longer uniqueness of Extension as an agency for informational services and for the organizational custodial duties of the community. The Extension System, as all other arrangements which respond to public need, must find considerable justification in a uniqueness of role and function. This is why the agency connotation must be thoroughly weighed in balance with the restyling of an institutionalized form of informal education. If we accept the former, the university or college attachment is in considerable doubt. If we accept the latter, the present substance of Extension work—and the manner in which it is organized—is in doubt. Three considerations bear importantly on the resolution.

The first consideration is that the urban industrial society ruthlessly and persistently expands community issues and policies; political groupings and economic processes; residential patterns and kinship relations; human mobility and occupational choice; and transportation and mass communications. Such expansions produce endless consequences for the articulation of the Extension System as an agent of change with the re-

recipient system as the target of change. Among these consequences there are two of particular importance for the present treatment. The first is the decline in usefulness of the concepts, rural and urban. People still live on the land, in dwellings, and in ecological groups of one sort or the other. But the forces which shape them, which confront them with choices, and which exact both exciting and dangerous circumstances of change—plunge in from without. The near mythical pockets of rural and urban, if they force us to divide thought and data between them, distort our sense of the larger and more expansive settings in which farmers, workers, families, firms and communities are placed.

The second consequence is that the historic strategy of the Extension System, in capturing the rural family as an almost exclusive clientele, fails in the urban industrial complex. The still remarkable growth and strength of the Extension System was affected by its alignment with the earlier and major developmental need of American society—that is, agriculture—and the convenient overlapping of the agrarian family, the farm, and the organization of labor and the productive processes. Neither—agriculture as a developmental need in American society and the family as a convenient recipient system of change—are as useful to Extension today as they once were. In the urban industrial society, the power of formal human associations, of multiple and specialized firms, the formalities of taxation and public planning, and the proliferation of pseudo-legislative bodies—all work to dilute and then erode away the loyalties of individual families as single recipient systems of rationally invoked change. In short, the strategy of gaining the loyalty of the family gives way to the necessity of gaining a sensibility to problems and the corporate group. An early requirement in Extension thought is in first sensing and then teaching the framework of family, farm, and community problems, with clientele, on the basis of style of livelihood and residence, as a dependent variable.

The second consideration is the hierarchical nature of educational experience. The Extension System is acutely practiced in knowing where to begin the process of informal education, but far less so in knowing where to take it. The farflung and deeply rooted resources of the Extension System, with all the overwork of its workers, is nevertheless underemployed in American education. The hard press of its organizational commitment, and the more than occasional belief that busyness is synonymous with accomplishment, are both restrictive to informal curricula which assists learners to move progressively into more expansive and deeper areas of thought and action. One fascinating schizophrenia of Extension work is the ideal claim of providing for the minds of people, and the operating aim of insuring the efficiency of farms. The post-sputnik emphasis on for-

mal education has unfortunately excluded the discussion of lifelong continuing education for adults. For the Extension System to become fully employed in *education*, the opportunity is present to demonstrate continuity in self-education for excellence. The specific aims of an agency of service cannot rightfully accept the obligation of meticulous care in designing continuity and constancy in self-education. But the Extension System can—in an advocacy of the precepts of lifelong education for adults, the fellowship of teacher and learner, and the communion of citizen and community.

The third consideration is the increasing requirement for the flexible assignment of Extension resources. Again, within the agency context of an urbanizing community, with so many evangelists and so few sinners, the Extension System can well afford the time and the risk for experimentation in the interdisciplinary organization and allocation of educational resources. To be other than experimental means that the activity of the Extension System may spring from a curricular slum of isolated and unrelated doses of information. Our current specialism is narrow and should be hopefully deep, but we frequently lose these dimensions by spreading them broadly and regrettably shallow. The broader questions of management, planning, and policy-making require imaginative designs between specialties. The alternative to achieving these designs is turning specialists into showmen and creating a mayhem of unneeded emphases in needful situations. One response of Extension is the meticulous matching of specialists and county agents in joint and intensive plans. This means that some specialists may intently focus in some locations for longer periods; for shorter periods in other locations; and exclude still other locations, at a given moment, completely.

Another response to the matter of flexibility is that to be made by administrators, and especially the Extension director. A chief dilemma of the Extension System is in discovering the high order of comprehension and fortitude which is required for discovering the objectives of the institution and marshalling and arranging the resources to achieve them. The formulation of Extension programs, at any level, should flow more from the collaborative exploration and understanding of situations than from the orders of administrative office—the “depersonalization” of program decisions, in the word of Mary P. Follett. The collaborative mastery over situations by persons who represent a wide range of specialties demands a continuous discussion, if not lively debate, throughout the entire system. To arrange for such debate is an essential responsibility of the office of the Extension director, if he is to be a leader rather than an office-holder.

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II. Orientation¹

If the style of an institutionalized form of education is assigned to the Extension System, what should be its educational posture in reference to a modern agriculture and community life which is no longer uniquely urban or rural? The contention of this paper, as it has been of others by the author, is that the most useful orientation is that of management. This orientation is not necessarily farm management or home management nor any other discipline in which management may happen to be a central feature. The management orientation, as used here, is an outlook or point of view toward problem-solving, and deliberately assumes interdisciplinary arrangements of the more traditional subject matters. To be quickly pointed out is that the management orientation is a liberal—or freedom-inducing—idea to education, and one in which the Extension System may take considerable pride. The liberalizing element springs from the processes of thought which unlock meritorious choices from the ritual and often overriding logic of the industrial society. It provides for true handiness and versatility in choice-making which people experience because Extension teachings were so organized.

Such versatility centers about three pivotal applications of Extension work. The first is the farm family, and we term the process, *decision-making*. The second is the neighborhood, community, and region, and we term the process, *planning*. The third is at the governmental level, and we term the process, *policy-making*. This model requires investigation of ever-expansive settings, and is bound together by the processes of management: the focusing of attention on the circumstances found in given situations; discovering the problems which the circumstances yield to achieving objectives as expressions of goals and values; identifying the alternative solutions which are available; the varying requirements of the solutions, or resources and techniques; judging, if not measuring, the probable consequences of the alternative solutions; and confronting the probable responsibilities which particular alternatives will exact if elected. The dynamic element—the feasible reduction of alternatives to the most desirable combination of resources, consequences, and responsibilities in response to given objectives—is identically related to farm family decision-making, community planning, and governmental policy-making.

Beyond the liberalizing implications for Extension work, the management orientation fulfills other important specifications for tomorrow's Extension programs. The criterion of relevancy is injected, since the

¹This section on orientation is a similar analysis to that in P. A. Miller, "Social Science in the Extension Service," *Proceedings of the National Conference on Agricultural Policy*, Farm Foundation, Chicago, 1958.

management orientation directs the Extension System to a preoccupation with alternatives and the problems which impede their selection and achievement. This is the increasingly necessary safeguard against the aimless proliferation of specialities upon the often dimly felt problems of the people. The management orientation, focused at the three levels of our model, provides a much-needed framework to design continuous, and deepening, self-education for excellence. Each extension of the management orientation enriches the capacity and versatility of choice-making: from farm to neighborhood land use; from community organization to regional development; from national issues to international policies.

Each process—decision-making, planning, and policy-making—suggests its own set or rigorous questions for providing a continual deepening of educational pursuits. At the level of the family and the farm, an attention to decision-making forces, first, the crystallization of goals from values; calls, second, for a high order of intelligence and a stern discipline of responsiveness to resources; which, in turn, makes necessary the functional acquisition of knowledges by the learner, and the functional relationship of disciplines about the teacher. At the level of the community or region, farmers (and others for that matter) and Extension workers will discover, through the process of planning, the avenue into the wider world which shapes the farm, and which forms the seat of understandings and misunderstandings by which farming and agriculture receive continuing societal analysis, not only by farmers but by all those who basically depend on farmers and who pay for the analyses. At the community level the usual distinctions of rural or urban clientele begin to fall away. At the governmental level, as the interdependence of the urban industrial society comes to sharp relief, such distinctions at the point of clientele become virtually non-existent for educational practice.

Mastering such a threefold application of the management orientation is the new intellectual and program perimeter of Extension work. It challenges the farflung, deeply-rooted, nature of Extension work to search out and provide for people the connecting links between family, farm, community, and governmental levels, and, in so doing, provides the bridges of learning for continuous and deepening self-education for excellence. Such comprehensions are infinitely more complex than the transmission of isolated bits of information and the custodial care of community organizations; but it is this complexity which will make the Extension System relevant in its totality to the idea of the university, and will convert the Extension worker from the role of the technologist to the more useful role of the educator. Our threefold application of the management orientation will demand of the Extension System that it sense the reality of need; distinguish between need and want; and develop the tools for transforming the data of trends into

judgments on standards, the data of resources into judgments on alternatives, the data of internal lacks into judgments of external investments. Such tools must be amenable to flexible adaptation, ease of teaching, and continued ease in practice: for they are essentially procedures for detecting, collecting, sorting, using, and evaluating the data of resources, goals, and alternatives. When these duties are accepted, the Extension System will have become more an institution of liberal education, less an agency which extends the technologies of vocational practice; and it will be, for educational purposes, fully employed.

There is a void in the countryside of America. The institution which attempts to fill it will gain a uniqueness at the level of our time. The void is partly a lack of comprehension and partly a lack of wisdom. The lack of comprehension comes in at the point of the generalizing of problems and the specializing of knowledge, the decline of ruralism as a fact and as a value, the interdependence of communities and the evolution of regional and metropolitan ententes, not only such much discussed phenomena as the vertical integration of farms but also the vertical integration of human life. The lack of wisdom comes in at the point of realizing that what is desirable development, efficiency, or change for one farm, community, or unit of government may be, in our society, dysfunctional or even undesirable for others. Decision-making, planning, and policy-making ultimately rest on a set of ideals to resolve the conflict between the need for cooperation and a willingness to understate particular aims, and the value tradition of individualism and competition. Even the Extension System fails to escape: for no institution or organization escapes the impact of change simply because it is the agent of change. This—the threefold management orientation—is to the author the exciting liberal—or freedom-giving—foundation of tomorrow's Extension System, adrift in a sea of people who are learning to live with science, and between the ports of an agrarian past and an industrial future.

III. The University

There is no more fascinating organizational case than that represented by the multiple structural linkages of the Extension Service. The various levels and zones of legislative, organizational, and administrative persuasion in the organizational facade of rural America hook into the Extension System, form its vast commitment of service, and not infrequently provide legitimate support and justification for the price of paralysis in discovering aims and assigning resources. Diffused throughout this facade is the value datum and the creed of the grassroots. Yet the same organizational facade has the latently paradoxical function of denying it: as expressed in the machinations of contemporary agricultural policy, the weakening of agrarian familism, private management, and freedom of

choice in the managerial processes, and the industrial substitutions for these of money or status success by the techniques of education and technological innovation. To reveal, identify, and criticize the inconsistencies and paradoxical elements is the responsibility of the university. The contemporary mission, and that of the future, of Extension work in extending the universe of rigorous inquiry in the university will increasingly suggest intensive exploration. For the clearest organizational distinction of Extension work is its fortuitous connection with the idea of the university.

It should be stated that the initial anchor of the Extension Service was more the rural community than it was the campus. Indeed, it was introduced to the campus with more than modest uncertainty. The rural community was little more than apathetic and responded with cool disinterest. The home campus was physically and psychologically a long way off. But through the half-century since, the Extension System has been working its way to the campus, although it remains less than the university in its substantive fullness, and more than the university in its organizational relationships and sponsorships. But paradoxically the rationale of the Extension System in the university has never been more in doubt, and for the following partial reasons: the swelling of the land-grant colleges into universities with new disciplines, supports, and clienteles; the partial loss of exclusive ownership of the land-grant idea to the evolution of back-country normal schools through the teachers' colleges to regional universities; the confrontation of land-grant institutions with developmental needs in society other than agriculture; the multiplicity of adult education facilities in the private and public university setting; the growth of private agencies engaged in dispensing technological services; the multiplying pressure on public appropriations for educational and public service programs; the not so subtle shifts in the balances of rural-urban political power; and the blunting of the consumer's interest in charging the society-at-large for stability in agriculture.

The prescription of this paper, however, is that the Extension System for its next chapter will find a more secure rationale in the university than in government. To accomplish this, two sets of conditions should be explored. The first set is a group of university-like functions. The second is a number of organizational adventures. Nevertheless, this author is uneasy; for while the Extension System is carrying on a debate about the nature of its future, and universities are carrying on a debate about what they are like and for, it is most difficult to find the areas of discussion which each is having about the other. If this prevails, the Achilles heel of the Extension System becomes more clear as the parent university, itself.

The first response of the Extension System to these circumstances is in

examining the university-like functions of Extension education. The first such function is in casting the intellectual rigor of the university into the larger community; and that first before us is a rediscovery of what the university is like and what it is for. This means, for the Extension System, the responsibility of example-setting, by looking to the intellectual order of its own house; and then the establishment of a university forum in which the university's resources, tradition, and purpose may be joined with the needs, wants, and larger issues of the community in such fashion that the intrusion of the university into the community is one of rigorous inquiry. If it is not, the intrusion is unworthy.

The second university-like function for the Extension System is a new subscription to the chief aim of the university: the advance of the intellect. The place of execution for the university function, and even the vivaciousness of the circumstances, does not alter the aim. The university, as no other human institution, is supposed to possess the universe and method of rigorous intellectual inquiry. If it does, this is what the university has to offer, more than anything else, to individual learners, communities, other institutions, and the agencies of technical and/or educational services.

The third university-like function is in illuminating the commonality of issues which transcend class, cultural, and provincial specificity. Agencies of educational services will be devoted only to fragments of issues. The university, by definition, is on another level of abstraction. It cannot evade the interrelatedness of the fragments just as it cannot evade the interrelatedness of its scholarly disciplines, nor fail in attention to both the humane (the general) and the scientific (the specific) queries. The extension of the university should provide for the larger community the genesis of the issue (or the heritage of human struggle), the sense of its present impact (or its meaning to the human condition), the alternative considerations to resolve it (or an exploration in matters of value). Even at this level, the management orientation suggests itself for the explanation of the Extension System in the academic community of the university.

The second response of the Extension System to its sector of the university lies in relating university programs to other institutions and agencies of educational services, and providing the rallying point for inter-university and inter-agency cooperation. For we are today confronted with the problem of cost, the extent and nature of the usefulness of the university, its increase in size, scope, and complexity, alterations in the structure of the population and the composition of the labor force, and the regionalization of higher education. Universities with state-wide orientations confront the interplay of regional and community colleges in their own newly emerging industrial-agricultural regions. Extension of

the former without regard for the latter may delay the wise organization of educational resources for adult education, and promises to be duplicative, costly, and unnecessarily competitive. Rational inter-university cooperation suggests the rational association of respective strengths rather than the possible dispersion of respective weaknesses. It is loyal to the people and it is attentive to the matter of cost. And as we consider the assignment of Extension resources in terms of the newer regional communities, the educational resources of universities without the region should in some fashion be joined with those within.

It would be less than fair to fail in stating that such organizational adventures will lead the Extension System into a whole series of perplexing questions, among which are the following: the functional and organizational relationship of Extension work to the rapidly growing General Extension movement; the administrative attachments of the state Extension director in relation to the agricultural colleges; the possibility of rounding out the Extension Service in some areas as the single field arm of the land-grant university (which it may not be, and is already not, in some states); the usefulness of the county as a principal administrative device in contrast to district or commodity areas; the nature of the preparation and assignment of county workers, and their organizational tie to the campus; the question of research participation for the Extension specialist (to which the author subscribes); the question of the first loyalty of the specialist, to profession or to Extension (the author elects the first); the paradoxical combination of commodity and disciplinary departmentalization—and compartmentalization—in the agricultural colleges; and, finally, the critical question of how much independence should be provided for the indigenous field office of the Extension Service.

IV. Conclusion

This paper has skirmished with three clusters of propositions which are involved in the intellectual exploration of future Extension work. The first cluster dealt with the Extension System as a system of educational experience rather than an agency for disseminating technical information. The second cluster dealt with the conceptual orientation of Extension education as the management outlook, or decision-making at the farm and family level, planning at the community and regional level, policy-making at the governmental level. The third cluster dealt with a rationale for the Extension System in sharing the treasure of the university, its method of rigorous inquiry, with the larger community about.

This has been an impractical paper. Its only excuse is that the recent leaders of Extension have been more practical than were such impractical founders as Seaman A. Knapp, Perry G. Holden, Kenyon L. Butterfield, and James Wilson. Extension work, may the author come to his own defense,

can well afford some impractical men. The Extension System is demonstrating an unusual vivaciousness in self-analysis. For this the author is pleased, for the system produced him and never wavered in any other than support. Yet, the uncompromising honesty of institutional leaders must squarely confront the impact of change on the life histories of institutions and organizations. If they fail to possess the honesty, or somehow fail to comprehend the nature of the impact, there is lurking in the shadows the metaphor of Matthew Arnold: "Wandering between two worlds, one dead, the other powerless to be born."

DISCUSSION: ADJUSTMENT NEEDED IN EXTENSION THINKING AND ORGANIZATION

M. C. BOND

Cornell University

Paul Miller presents a stimulating and challenging paper regarding changes in the Cooperative Extension Service. I shall not indulge in argument or attempt to rearrange the problems or issues. Dr. Miller presents these views only about two years after serving as chairman of a national committee of Extension workers who prepared the 1958 report on the Scope and Responsibility of the Cooperative Extension Service. He now looks at Extension from the viewpoint of a Vice President of one of the great Land-Grant Colleges of our country. Thoughtful students of Extension work associated with Universities will study Dr. Miller's paper more than once. They should also study the "scope" report mentioned above and the more detailed statements of the nine areas of program emphasis published in the fall of 1959.

Most agricultural economists are chiefly concerned with commercial farming, and related business services. These services include credit and farm supplies needed by farmers and the processes involved in marketing farm products. This broad business area is a phase of the educational program which is of major concern and importance to the Extension Services of the Land-Grant Colleges.

During the past four years, much has been accomplished in re-orientation of county agricultural agents toward the management aspects of commercial farming. Additional federal funds were a great help in providing some additional personnel and made it possible to focus attention specifically and industriously on management problems.

For more than a decade (the wartime years), farmers themselves were absorbed with matters of priorities, scarcities, and the application of new technologies in production. They were little concerned with problems of over-all farm organization and management. With relatively high prices, disaster did not result from managerial mistakes.

With the decline in prices for farm products more nearly in line with the general price level, errors in management became increasingly significant. Improvements in efficiency became more and more rewarding. Thus, commercial farmers were more concerned with management and organizational problems.

They now seek the results and study the implications of management research. This interest is not limited to farm operators. Studies of the interests and needs of homemakers indicate that they too put information on management near the top of their list of needs for educational assistance from the Cooperative Extension Service. Some exploratory work is also being done with older 4-H club boys and girls in programs to teach decision making. Some of the "career exploration" programs are basically aimed at decision making.

The Kellogg Foundation has provided funds to assist several states in an evaluation of the intensive program commonly called Farm and Home Development. The results of this 5-year study of changes and the effectiveness of different Extension programs will be forthcoming within a year or two. The Extension Service in the several States will be particularly interested in the effectiveness of the results obtained by the several means of developing and conducting this management program.

One very significant result of this intensive program is continuing training of county agricultural agents which has brought them up-to-date on the more complex and involved management problems faced by commercial farmers.

The extension economist has a key role in such training. He also may be very helpful in working with the Administrative staff in adjusting programs and in bringing all of the resources of the college to participate in this educational effort.

Adjustments in Organization

Farmers and homemakers are involved, to a greater or lesser degree, in the development of county Extension programs. This involvement of the students or recipients of educational work in the determination of program, is quite in contrast with that of more formal classroom instruction. Changes, therefore, are likely to come about more slowly than where an administrator is free to make independent determinations or even when a faculty make changes in courses offered students.

I see no evidence of less involvement of farm or other people in developing Extension programs at the county or community level. This seems to be a well established and acceptable pattern. Active local leadership is important to the full extension and effective use of information.

Perhaps the most pressing challenge to Extension organization has to

do with carrying on educational work in *marketing*. Formerly, much of the educational work in marketing with persons other than farmers was carried on by specialists at the Land-Grant College, either on a statewide or regional basis. Some county agents became involved and participated. Some of the work was done without involving county extension agents.

Marketing information for consumers has been made available through mass media and through the cooperation of home demonstration agents. The larger regional and statewide marketing educational work with cooperative associations, has been done for the most part by specialists located at the State Colleges. County agricultural agents have assisted and participated in varying degrees in the marketing programs with the local cooperative organizations.

Educational work with retailers and wholesalers provides an illustration of the greatest challenge to present Extension organization. A well-trained, relatively highly paid Extension Marketing Agent is needed to carry on continuing education with this group. This is particularly true of the smaller retail firms, including supermarkets and localized chain store groups. It is less true of the larger chains where the educational work needs to be done with supervisors, who in turn, pass information on, in the form of instructions, to individual store managers and supervisors of the several departments in the retail store.

Much of the marketing research done in the field of retailing and processing has been by the U. S. Department of Agriculture.

This also creates some problem in terms of presenting and interpreting the results of these studies to both specialists and marketing agents in the several States.

In carrying out an effective educational program with firms engaged in marketing the Cooperative Extension Service faces several important questions. Shall we have a separate department in counties where large cities provide many retail outlets and provide special agents to work mainly with these groups? How can the Extension Service best bring the information from several disciplines to bear on the problems facing retailers, wholesalers, processors, and similar marketing firms? How can we train marketing agents to be most effective in their relationship with the State Colleges and other extension agents, as well as to the persons they teach?

The papers presented at this Extension session have been carefully prepared. They propose deep challenges. It is encouraging to the administrative staff to have continuing interest on the part of former extension workers and the deep and broad concern and help of extension economists.

THE ROLE OF THE AGRICULTURAL ECONOMIST IN INTERDISCIPLINARY EXTENSION WORK

NOAH S. HADLEY
Purdue University

IN THE preceding papers, Dr. Williams and Dr. Miller have stated in effect that Extension Service has not kept pace with our changing environment, and that substantial changes must now be made if we are to retain a position of leadership in American agriculture.

My assignment is to appraise interdisciplinary extension work as one of the alternative methods of modifying extension teaching to meet current needs.

Why is there hope that the interdisciplinary approach may help Extension Service to retain a position of respected leadership in American agriculture?

Let's look at the record.

Since the creation of Cooperative Extension Work in 1914, Extension Service has developed in many ways. In the early years of Extension Service, agricultural education was concerned largely with the teaching of facts and physical skills. Teachers made recommendations—wrote prescriptions. These facts and recommendations were accepted or rejected largely on the basis of the personal values and traditions of the learner. Extension Service has become very proficient and highly respected as a purveyor of facts.

In the early years of extension work, county agricultural agents were almost entirely teachers—teachers of facts and simple relationship. They were demonstrators. But with the passage of time, they have become involved in many related activities and in recent years have tended to become more administrative. They are organizers, promoters, and have less time for teaching. The breadth of the work they cover makes it almost impossible for one man to be well enough informed to teach in all of these areas.

Extension specialists have generally operated along departmental or disciplinary lines. These specialists have prized academic freedom very highly; they have operated almost independently. Communication between disciplines and departments has not been the best. Sometimes conflicting and even contradictory recommendations have been made by specialists in different disciplines.

As new technology was applied to the farming business, farms became larger and more complex. The need for bringing the resources of various disciplines to bear on a specific problem of a single farm became ap-

parent. The need for allocating resources was recognized. In other words, the need for management was recognized, and farm management departments were organized throughout the country. But the other disciplinary specialists continued to operate pretty much independently. Conflicting information continued to go out.

As the business of farming became larger and more complex and highly competitive, the sheer quantity of knowledge required to operate a general farm became staggering. In an effort to more effectively utilize resources and also to narrow and deepen their fields of competence, many farmers turned to specialization. Through specialization both on and off the farm, thousands of new businesses were created to serve farmers in supplying them with goods and services and in marketing their products. These businesses serving agriculture also needed help in management and a new branch of Extension Service was created in the field of marketing. Management men in this area, also, dealt with data from many other disciplines but they had no well-defined provision for liaison with other disciplinary specialists.

Finally, the management function and orderly problem solving process began to be applied to the solution of group problems. Public policy became a part of extension teaching. Farm management departments disappeared and departments of agricultural economics took their place. But with few exceptions, good lines of communication still were not set up between the management man in policy and the disciplinary specialist in the human sciences.

During the 45 years since extension work started, we have seen far-reaching changes in the physical make-up of the commercial farms of the nation. But at the same time, there have been remarkable changes in the men who operate these farms and manage the businesses which serve them. The highly competitive nature of agriculture during the last half-century has gone far to weed out the less competent. Successful farm and firm operators today are highly capable, well-educated, and extremely well-informed in their specialty. They no longer want to be told what to do, but rather why it should be done. They are not primarily seeking facts, but rather understanding. The challenge of the educator is not to bring about changes in knowledge and physical skills but changes in understanding, in the mental skills of decision making, and indirectly in attitudes and values. Only highly competent, well-educated, and completely informed extension personnel can long hold the attention or command the respect of this clientele.

The essence of management is problem solving and decision making. It is the application of economics to specific problems. It involves not only a working knowledge of economics, and a thorough understanding

of the processes of decision making, but also an intimate knowledge of other sciences or disciplines related to the problem. For example, to effectively organize a cattle feeding farm, the manager must have a working knowledge of economics as it applies to his business. He must be skilled in decision making, he must be reasonably well-informed in the technologies of agronomy, beef cattle nutrition, disease control, and engineering. He must also be well-informed about markets and prices.

Originally in extension work the burden of bringing together the contributions of various disciplines was largely left to the managers of the farm or the firm. More recently the management (agricultural economics) specialist has shared this burden. The growing complexity of our economic, social and political environment, and the trend toward specialization have made the task of the general agricultural economist increasingly more difficult. The general agricultural extension economist faces the dilemma not only of spreading himself over the widely diversified areas of farm management, marketing, and public policy, but also of becoming more competent in each of them. This pressure has resulted in two significant changes. The first of these is the tendency to specialize. The second is the development of the interdisciplinary approach.

The interdisciplinary or task-force approach to problem solving in extension work is the result of need for a considerably higher level of competence and the great amount of technological information from widely varying disciplines which is necessary to intelligent problem solving.

What is the role of the agricultural economist in interdisciplinary extension work?

First, he must be competent in his area. This means some degree of specialization.

Second, he must assume a major role in structuring the work of the interdisciplinary committee to the process of management problem solving. This is his area of major competence. This is where he can make the greatest contribution.

Third, he must help specialists in other disciplines, both extension and research, to have greater understanding and appreciation of the whole problem. This helps them to more carefully tailor the contributions of their respective disciplines to the solution of the problem. It also helps them to structure research designed to provide new information needed for the solution of the problem.

Fourth, he must rely upon the specialists from other disciplines as the sources of up-to-date technology regarding the problem.

The fifth role of the agricultural economist in interdisciplinary extension work is to help develop a system of disseminating the fruits of

the interdisciplinary effort, particularly the economic and managerial aspects of it. This includes the training of extension personnel as well as direct teaching of persons concerned with the problem.

The sixth area of responsibility is one in which the agricultural economist can engage only by invitation. This is in helping the administrators of Extension Service to reorganize extension work to more effectively meet the needs of our times. Some will be reluctant to undertake this task. Some administrators will not seek our counsel. Obviously the agricultural economist is not in a position to make decisions, nor would it be appropriate for him to try. However, he is in a better position than most to contribute to the solution of the problem by analysis of the situation, identification of alternatives, and appraisal of consequences. It is no different from helping in the solution of problems of a farm, a processing plant, the reorganization of public schools, or the problems of farmers' price and income, except that the extension administrator approves the pay check of the agricultural economist.

Now by way of example I want to report to you what we have done and some of the problems we face in our efforts with interdisciplinary approach to extension work in Indiana. I use Indiana as an example, not because we have done more or better work in this area than has been done in many other states, but rather because I am familiar with it.

At Purdue interdepartmental cooperation is of long standing. Until recently this has been on a very informal man-to-man basis. It has been very useful and very helpful; but it has not met the whole need.

Over the past several years we have noted a rather marked and continuing decline in attendance at our meetings. We have noted a tendency on the part of our better farmers to by-pass the county agents and go directly to the specialists at the state level or even directly to the research people.

There has existed a rather apparent lack of co-ordination between the departments in our institution. This lack of co-ordination was somewhat apparent in publications and in the teaching of the various specialists in public meetings. But it has been particularly evident when top-flight farmers came to the campus and visited a series of extension specialists in efforts to get information regarding the solution of a specific problem. When these farmers got conflicting information from two or more well-known specialists on our campus, extension's reputation for competence was immediately questioned. This lack of co-ordination arose partly out of the idea of academic freedom and independent operation, but I believe we have demonstrated that it was largely the result of inadequate communication.

Our initial efforts in the area of interdisciplinary extension work were

not the product of anyone's foresight or wisdom. This work was initiated because of the direct pressures resulting from lack of co-ordination.

Late in 1956 our first interdepartmental committee was formed. As you know, hogs provide about 35 percent of the income to Indiana farmers. (This is our number one source of income). During the last several years, there have been revolutionary changes in the hog business, so it was only natural that the first ID committee was set up to work in the hog enterprise.

This committee was made up of research and extension personnel from the following departments: Animal Science, Agricultural Engineering, Agricultural Economics, and Veterinary Science. After about six months of intensive effort, a preliminary report of the committee was made at a special extension workers training conference. After this conference, all of the extension workers were asked to make suggestions for improving the report. After these suggestions were made, the committee refined and polished the report and published it in the form of Extension Bulletin ID 19, entitled "Considerations in Intensified Hog Raising Systems." Following the publication of this bulletin, district and county meetings for farmers were conducted by the interdepartmental personnel. These meetings were very enthusiastically received and well attended by farmers. Farmers were quite vocal in their expression of praise for this work. The publication has been extremely popular, is now in its fourth printing, and over 50,000 copies have been distributed. Similar work has been done in connection with beef cattle, dairy cattle, and materials handling. Altogether this work has been highly successful. In the areas undertaken for study, the demands for assistance have by far exceeded our resources to meet them.

How can we meet this demand? The publications and meetings have accomplished much. The innovators and early-adopter groups are fairly well served, but the rank and file still need much more assistance in enterprise planning. There is a great need for small group discussion meetings and considerable demand for individual assistance, much as in the case of over-all farm planning as done in farm and home development work.

The interdepartmental committee operating as a unit cannot serve this need.

The following are some of the alternatives which we are considering:

(1) Depend on the publications and mass meetings, make little effort to serve the large group of farmers who will need additional assistance, and let them learn from the innovators and early adopters.

(2) Encourage extension members of the ID committees to undertake enterprise planning. Several members have already become reasonably proficient in this work. They are able to help farmers organize their enter-

prises. Their efforts are in high demand. But if they devote their energies to this work, who will perform the task of the technology specialist previously done by them?

(3) Train the county agent to do this work. Some of them could learn to do this work, others might not. But assuming that they could and would be willing to do this work, can a county agent be competent in several different enterprises? Moreover, can he devote much of his time to enterprise planning and still meet all of the other demands on his time?

(4) Another alternative which is receiving consideration is to develop a group of enterprise specialists. This would be a new kind of extension specialist—a man specialized in enterprise organization and operation, who cuts across disciplinary lines, who is trained in economics and problem solving but is quite up-to-date in the technologies as they apply to the specific enterprise. To be competent this enterprise specialist would have to be supported by disciplinary specialists in both research and extension. He would not be a substitute for either the county agent or the specialist but would render a service not now being adequately performed by either one.

If we assume the need for such a man several questions must be answered. How would he be financed? From new appropriations, or by re-allocation of existing funds? Could some of the resources now being used in farm and home development and possibly some of the resources now being used for disciplinary specialists be used for enterprise specialists? Should he be located at the college or in the field? Good reasons can be listed for either. If he is located in the field, should he be assigned to a county or a district? In other words, what geographic area should he cover? Obviously this will be in part determined by the importance and concentration of the enterprise within the area.

To whom will he be administratively responsible? Should he be a member of the agricultural economics department? His job will be primarily management. Much could be gained by having him associated with other people working in management. But how then can the vested interests of other departments be satisfied? Also, how can satisfactory liaison be kept with the technical specialists?

Should he be directly responsible to the director of extension? This would meet the vested-interest criticism, but would give the enterprise specialist no real professional home and would not necessarily provide close working relationships with any department.

Should a new division of extension be created to administer this work, possibly headed by an associate director or a district director? This approach would obviously help solve some of the problems but would definitely create others.

There are doubtless many other alternatives, but it is not my purpose to work out a solution to this problem. Rather it is my purpose to point up the fact that the big challenge is to recognize that these problems are broader in dimension than interdepartmental or interdisciplinary cooperation and that the solution to these problems involves rather exhaustive analysis.

These problems differ markedly from state to state. No uniform policy can be worked out for the nation. But the agricultural economics departments of the several states may be able to make substantial contributions by helping their administrators make a careful inventory and analysis of the situation in the state, by identifying and developing possible alternatives, and by evaluating probable consequences.

I have described here only one facet of the whole problem. I have dealt only with the interdisciplinary approach in farm management. However, I know that similar problems exist in other phases of our work, particularly in firm management and in public policy.

During the last week in May and the first week in June of this year, the agricultural economics department of Purdue University conducted a self-evaluation conference in which we tried to take a hard, objective look at what we are doing, what we ought to be doing, and how we might do it more effectively. During this conference we made a rather careful analysis of our work. We identified a number of weaknesses and proposed a number of alternatives for change.

As we attempted to project agricultural economics extension work for the next few years, we recognized that some changes could be made within the structure of our department, but that other important changes involved the broader structure of total extension work. Here are a few of the problems:

(1) In the field of farm and firm management extension, how intensively should we teach? Where is the dividing line between education and service? Is a tax-supported institution justified in providing individual consultation? Or should this be left to private enterprise?

(2) In the area of public policy, what are the limits of our responsibilities? Do we deal only with problems of concern to farm people? With problems related to agricultural business? With problems of concern to users of agricultural products? Or with any and all public problems?

(3) In contrast to these rather specific questions we are interested also in the great ground swell in the development of broad, general, adult educational programs for all society. What is the role of the agricultural economist in this area?

During the past generation, we in this country and people in other parts of the world, have made tremendous progress in the physical sciences, in

man's understanding and control of nature. With this new science we have built a fantastically efficient and powerful physical plant. This new physical power has generated a very complex social, political, economic, and cultural environment. Technological progress has created problems that must be solved by institutional innovations. These institutional changes involve the attitudes and value judgments of large groups of people. Teaching in this area is a slow and hard process. But this new and highly complex structure can be governed through democratic processes only by an extremely well-informed and understanding public. A comprehensive and objective adult educational program in public policy and government is imperative to the preservation of democracy. As a result of this situation, broad, general, rather comprehensive adult educational programs are being established. The agricultural extension worker's role in this development is not yet clear. What relationships will we have with this new development in adult education? In agricultural extension work we have a running start in the field of adult education, of applied economics, and in the use of the group problem solving techniques. Can this be developed as a contribution to a broader interdisciplinary adult educational program?

(4) To what extent can a more sophisticated, formal, sequential curriculum be used in adult education? Traditionally extension education has been designed to solve immediate and specific problems. Principles of the physical sciences or of the humanities have been taught mostly by indirection and by application. Have we now reached a point in intellectual maturity where a more direct, more orderly and more formal approach can be made?

(5) The problem of major concern is how to get the resources to meet the ever-expanding need for management. Public policy work has grown up in response to recognized need, but largely without corresponding appropriation. Most of the resources now being used in public policy have been siphoned off of what were originally farm management or, to a lesser degree, marketing funds. In other words, Extension Service as a whole still worships largely at the feet of the god of technical efficiency. We have very considerable resources to promote production, but pitifully small resources to deal with the problem involving the behavioral sciences—with man's understanding of man.

Extension Service is being roundly criticized for continuing to emphasize increased production in a period of burdensome agricultural surpluses. A shift in emphasis from greater production to the problems of adjustment and other public policy issues appears to be imperative if Extension Service is to retain a position of respected leadership. It seems clear that in the long run this change in emphasis is as much in the self interest of the technical specialist as the economist. Interestingly enough, many technical

specialists agree with this viewpoint. They recognize that, as Benjamin Franklin said, "We must all hang together, or . . . we shall all hang separately."

Now comes the interdisciplinary approach. It has proven to be highly successful and very useful, but like all beds of roses, it has its thorns. At times this approach is very tedious, sometimes frustrating and always very time consuming. The agricultural economics department must in some degree match the personnel of all other departments. This takes time and it takes work. It is an improved method of teaching but not an easy one. It takes more rather than less resources. How do we meet this new demand, how do we meet the greatly expanded need for work in public policy without depleting our resources in older yet much needed lines of work?

Last week, just before coming to this conference, a questionnaire was sent to all of the extension farm management and policy men in our department. This form asked for a report of all of the commitments we have and an estimate of the time requirements for the next six months. As you have already guessed, these reports came back showing an overload of anywhere from 30 to 100 percent—and they were quite realistic.

What should we do about this? Obviously we should cut out the less important and devote our resources to the more important. But I assure you that this has already been done.

Most of the work we are doing can be classified under two headings: (1) That which we must do to keep prepared for our jobs and (2) tasks which have been assigned to us. If we cut much more, we must cut something which is vital.

I know that this situation is not peculiar to Indiana. I am sure that all of you find yourselves in much the same position. I think we have fully demonstrated that any man who has proven his competence in the application of the human sciences to current problems finds himself overburdened with requests for his services. Within our own profession this applies about equally to farm management, marketing and public policy personnel. It is not a problem which can be solved by shifting resources within the department. This problem involves the organization of not only Extension Service, but the total adult education program.

Summary

I have tried to list some of the big problems that lie before us. I have made no effort to provide answers to these problems. This is a challenge to the best individual and collective thinking of all of us.

I am sure of only one thing: Agricultural extension work, as we have known it, must change or die.

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out of farming. This situation applies equally well to all of the institutions supporting agriculture. The situation applies to Extension Service as an institution and to agricultural economics as a profession.

Adult educational programs are being organized to provide assistance to a greatly enlarged non-farm population. This work of necessity must be largely interdisciplinary. Shall we strive for a position of leadership in this effort, or do we yield the task to hands less bound by old concepts, traditions, and institutional structures?

But in addition to the challenge in this relatively new area, if we are to be worthy of the name of agricultural extension economists our real challenge lies in serving the one or two million commercial farmers who will produce the major portion of the food and fiber of the nation, and to the business firms that furnish their supplies and market their products. These farms and firms will be large and specialized and yet complex. They will be managed by men who are highly capable, well-educated, and well-informed in their specialty. These managers will be faced with constantly changing technology which must be evaluated economically. They will not be satisfied to get their information piece meal from contradictory sources. They will not be satisfied with just knowledge and skills, they also seek understanding.

If Extension Service is to retain a position of leadership in the business of agriculture, we must learn to effectively serve this group. The interdisciplinary approach to problem solving gives much promise in meeting this need, but fundamental changes are needed in our institutional organization to permit effective and efficient interdisciplinary action. The extension economist has an important role in guiding institutional change and in the leadership of the interdisciplinary processes.

DISCUSSION: THE ROLE OF THE AGRICULTURAL ECONOMIST IN INTERDISCIPLINARY EXTENSION WORK

S. B. WEEKS

University of New Hampshire

It is my opinion that Professor Hadley has covered his assignment so thoroughly that very little can be added. While one might dot an occasional "i" or cross a "t," it seems to me that this form of argumentative heckling serves little real purpose and is of no value.

Having left me no room on his soap-box, I have decided to set up shop across the street. Solely for the purpose of exploring the problem of interdisciplinary extension work, I shall take exactly the opposite position and see whether any case can be made for it.

In mounting my anti-interdisciplinary soap-box, I want to start by say-

ing that Hadley's general thesis is that the continued drive towards specialization on the farm raises two fundamental issues for the Extension Service. There are: How to continue to be effective teachers, and how, administratively, to structure our organization.

I agree with both the analysis of the problem and the selection of the issues.

His proposed solution is that interdisciplinary cooperation will aid the Extension Service in adjusting to the problem.

I counter this proposal by suggesting that we can find evidence to the contrary. I would hasten to add, however, that this evidence is by no means conclusive, that the final score is not in, that the kind of comparative analysis used may be quite unjustified.

I would, for purposes of analysis, like to look at three areas of evidence. These are: a) the specialized firms outside of agriculture; b) non-agricultural teaching; c) recent trends in the organization of agricultural teaching and experiment station work.

First: Industry other than agriculture. Here we find specialization of the individual firm by function or product has been going on for a good deal longer and at a much greater degree than in agriculture. It seems quite likely that industry's experience in specialization represents in form if not in degree the future of the agricultural firm.

What evidence do we find of interdisciplinary cooperation within the specialized non-agricultural firm or industry?

I think we find very little. We find that almost invariably the call for higher and higher levels of technological competence leads continually to further and narrower specialization, that this in turn appears to lead to further and further fragmentation of divisions into sections, branches, units, etc.

Secondly, it appears to me that almost all communications within the specialized industrial firm are vertical rather than horizontal. You do not report, request, or cooperate, except through well-marked channels which flow up and down, not sideways. The manager in this case, much like the manager of the modern agricultural firm, calls on specialized specialists not specialized generalists. He want facts from them and, given these, he makes his decision and issues his order. He has a delegation of both responsibility and authority and exercises both. If he makes a mistake, he is replaceable.

Let's next briefly examine non-agricultural teaching. Empirical observation leads one to the conclusion that in teaching, the age of specialization has been characterized by a proliferation of departments and courses.

There is, I think, considerable evidence of some interdisciplinary cooperation among the Social Sciences; History, Psychology, Sociology and

Economics have demonstrated some tendency for amalgamation, both informally and also in a true interdisciplinary sense. The same general observation can perhaps be made for Physics and Chemistry.

The issue I would raise with these examples, however, and especially for the latter, is this: are we in fact getting real interdisciplinary cooperation or were we wrong in the first place by assuming that separate disciplines existed?

My final observation in the matter of our experience with interdisciplinary cooperation is that which we have had within agriculture, particularly the College and the Experiment Station. A typical College of Agriculture department, when compared to non-agricultural college departments, has been, I feel, almost an ideal example of interdisciplinary cooperation. In function it has included teaching, research and extension. In structure it has, by its commodity orientation, rather than its disciplinary orientation, been an example of interdisciplinary crossing. The typical dairy department, for example, contains nutritionists, pathologists, geneticists, manufacturing specialists and frequently management and marketing specialists. Parallel to this department we find a poultry department and an animal husbandry department, both similarly structured.

Has this arrangement proved a satisfactory way of life? The evidence is to the contrary. All over the country we find a reexamination of agricultural colleges' organization and curricula.

In terms of the latter, the general trend is to encourage students to specialize within broad disciplines such as plant sciences and animal sciences rather than across the board.

In terms of structure, it seems to me that a similar trend is developing. Administrators are, for example, attempting to get management and marketing out of commodity departments and back into economics departments. Present department structures are being broken up and rearranged by general disciplinary grouping, such as agribusiness, plant science, home economics.

Perhaps the fundamental problem is not one of interdisciplinary cooperation versus non-interdisciplinary cooperation but rather a matter of selection. I suggest that in a highly specialized technological age the only place we can or should get interdisciplinary cooperation is when the disciplines are in fact interdisciplinary—in other words, the idea is excellent but like many other generalizations it should not be seized on as a cure-all for all problems.

In conclusion, just a few comments on the matter of agricultural economists.

We have had a long and honorable history of suggesting to administrators and other scientists that if they would just let us help them run their

businesses they would be considerably better off. So far they have manfully resisted our affection.

I think my own feeling is that, were I given a free hand in structuring the Extension Service, I would want to be able to count on the cooperation of the various subject matter specialists to furnish me facts but that essentially I have too much to know about my own field to find time to acquire any real knowledge of their disciplines.

I would, as an extension economist, like to minimize the amount of teaching I do in the area of specific production techniques and maximize the amount and quality of teaching that I do in the area of the principles of economics, which incidentally I consider largely synonymous with farm management.

Essentially I think there is a stage for true interdisciplinary cooperation. This is at the point where the individual manager of the farm firm collects the data, analyzes the data, applies the data, and selects a course of operation.

The farm management decision-maker, that is, the farm operator, who is led to believe that someone else can satisfactorily perform this function for him may be led down the garden path.

ENCOURAGING FUNDAMENTAL RESEARCH IN AGRICULTURAL ECONOMICS

Chairman: W. I. Myers, Cornell University

THE AFEA-SSRC COMMITTEE ON NEW ORIENTATIONS IN RESEARCH

H. M. SOUTHWORTH
The Pennsylvania State University

I APPEAR before you this morning in a duplicate capacity—that of chairman simultaneously of the Committee on Agricultural Economics of the Social Science Research Council and of the Committee on New Orientations in Research of the American Farm Economic Association. The two committees consist, for the most part, of the same people.

My assignment is to report to you on the origin and present status of these committees. But my main hope and objective is to get your ideas regarding their purpose and how this purpose may be achieved. Hence, I shall make my own report brief.

One of the committees that I represent is old, the other new. The Social Science Research Council has for many years taken an interest in agricultural economics. An early activity of the Council in this field was sponsorship of the *Scope and Methods* studies some thirty years ago, which still are cited for their outstanding contribution to orientation and guidance of our research at that time. Several leaders in our profession can also point to SSRC study grants that afforded personal opportunities for professional growth and development at strategic points in their careers. I will not attempt here, however, to detail the varied contributions that SSRC has made to the advancement of agricultural economics over the years. Rather, I will confine my report to the genesis of the present undertaking.

The present undertaking has grown out of a report prepared for the SSRC Committee on Agricultural Economics by a Subcommittee on Fragmentation of Research. This subcommittee was established over a year ago. It grew out of discussion of the failure of our profession to follow through systematically in many areas of research—the tendency to fly from project to project without ever taking time to consolidate our gains. The question was whether this might be an important limitation upon the effectiveness of our work, and whether the time was not therefore ripe for setting a few people aside to attempt comprehensive compilations and appraisals of the status of research in various fields. The subcommittee was appointed to explore this question.

As often happens, when the subcommittee dug deeper into the matter its ideas on the scope and causes of the problem broadened. The report that it presented last fall bore the larger title "Reorientations in Agricultural Economics," and the content was correspondingly broadened. The "fragmentation" problem was not forgotten. But it became only one piece in a larger picture.

I shall here only summarize this report. An abbreviated version of it was published in the SSRC *Items* last March, and a more complete version appears in the August issue of our own *Journal of Farm Economics*, so it is readily available to all of you. I shall confine my present remarks to the gist of the argument.

The report points to the critical changes currently being faced by agriculture in this country, and to the limited contribution of agricultural economics towards resolution of the attendant problems. It diagnoses the difficulty as arising from the inadequacy of our traditional sub-disciplines, that developed around the problem foci of twenty, thirty, or forty years ago, to encompass the new types of problems that confront us today. I quote from the report:

It is our thesis that many critical economic problems currently confronting agriculture are not divisible into traditional thought compartments; that a too complacent or too rigid adherence to those compartments handicaps both imagination and breadth of attack; and that there is therefore need for bursting these bonds in order to achieve more creative approaches. Changing times call for changing strategies—for reformulation of problems into new categories, and for a corresponding regrouping of our intellectual forces. Restricting our efforts to our traditional thought compartments can be expected to generate only fragmentary research results.

The report illustrates its thesis with a number of current problem areas that cut across the traditional fields of specialization within agricultural economics. I shall mention these in a moment.

Let me first, however, jump to the sub-committee's recommendations, that have resulted in my being here today. Again, I quote:

Reorienting our professional thinking so as better to come to grips with the critical emergent problems of today's agriculture will require more emphasis on:

- (1) Identifying and directing attention to these problems;
- (2) Formulating them imaginatively, as whole problems, not as separate pieces, assumed to be independently soluble by traditional approaches;
- (3) Organizing our existing knowledge so that it may be utilized effectively;
- (4) Identifying the gaps in our knowledge—in theory, in methodology, in empirical studies—that must be filled to enable us to attack the problems;
- (5) Undertaking the research needed to fill these gaps.

To accomplish these things will require some innovations in our *modus operandi*. It will require, in the first place, directing professional attention to the problems and to the need for more effective attack upon them.

Second, it will require giving encouragement and support to those stimulated to undertake the needed research. This includes not merely making funds available in support of appropriate "projects." It means fostering a continuing professional environment in which workers will be challenged to undertake the essential tasks and will feel assured that these offer attractive career opportunities comparable with those in the familiar grooves.

Third, it will be necessary to broaden the range of professional competence brought to bear on our problems, both institutionally and in terms of discipline. Greater interest must be encouraged among workers in private as well as public institutions, and active participation must be drawn in at many points from general economics, from the other social sciences, and from philosophy.

Finally, marshalling effectively the intellectual forces unleashed in the foregoing process will require developing new generalists, able to draw ideas from more than a single subdiscipline in formulating and attacking the problems we face.

In the belief that development of new, more effective orientations in agricultural economics research is a matter of general concern to the whole profession, the subcommittee further suggested that our Association establish a committee to foster efforts in this direction. The suggestion was laid before our Executive Committee, which responded favorably. Hence the Association committee on behalf of which I am reporting to you today.

Since the Association does not have funds for the support of this kind of undertaking, the Social Science Research Council is continuing its godfatherly role by keeping us on as its Committee on Agricultural Economics.

The members of our duplicate committee are Kenneth L. Bachman of Agricultural Research Service, USDA; and George K. Brinegar, of Connecticut—both members of the original SSRC subcommittee; plus Robert L. Clodius, Wisconsin; Sidney S. Hoos, California; Marc Nerlove, Minnesota; and William H. Nicholls, Vanderbilt. In addition, the two most recent Past Presidents of the Association—H. B. James, of North Carolina, and Harry C. Trelogan, of Agricultural Marketing Service, USDA—accepted appointment as members of the Association committee. (Brooks James will now be replaced by R. G. Bressler, our currently retiring President.)

The committee held an organization meeting in the spring, at Vanderbilt, out of which came a number of assignments by which the members are themselves undertaking, and are seeking assistance of others, to develop definitive plans for research that would bring new orientations to bear on some of the problem areas the committee discussed. A second meeting is planned for the fall to appraise the results and to plan ways to follow them up.

So much by way of report. Our real task is hardly yet begun, and how

it is to be done is the main concern here today. Let me say that our work has already aroused some interest and discussion among the limited group to whose attention it has so far come. We have had a number of encouraging communications, and some criticism. Glenn Johnson, of Michigan, for example, has drafted a paper offering an alternative diagnosis. He presented a preliminary draft in a seminar at Penn State, and I take the liberty here of briefly indicating his thesis: namely, that our professional shortcomings spring not from an obsolete compartmentalization of our subject but from (1) confinement of our analysis within static approaches, and (2) confinement of our value judgements within the Pareto-optimum framework.

Such a condensation, of course, does not do justice to Johnson's analysis, and it is unfortunate that, being in Europe, he is not able to be on the program here today to expound it adequately. But I shall not attempt to refute Johnson's diagnosis. Indeed, I agree with much of it. However, I do not think that it contradicts that by our committee.

Let me clarify this with an analogy. Take so common a thing as a bellyache. It can be diagnosed in several ways. Simply to identify it as a bellyache is one level of diagnosis, especially if more dignified terms such as indigestion, or intestinal upset, or, in the old days, dyspepsia, are substituted. At another level, it can be diagnosed as due to spastic intestinal contractions, or perhaps to ulcers. At still another level, it can be attributed to improper diet; or, again, to overwork, to lack of exercise, to emotional maladjustment, or to some combination of these. Now all of these diagnoses may be "correct." Yet collectively they lead to quite a variety of prescriptions—taking bicarbonate of soda or tranquilizers, going on a diet or taking up golf, going on vacation or changing one's job, or having a professional analysis made of one's subconscious. The question is, which or what combination of these things will most improve one's health and vigor?

Without claiming that our diagnosis is uniquely correct, the committee nevertheless believe that research in the profession would be benefited by our prescription; namely, seeking new orientations—fresh approaches, if you will—towards some of the major economic problems confronting today's agriculture. Let me draw upon the original subcommittee report for illustration.

Technological progress and its impact is one such problem focus. This can be put in farm management terms, and the question is how shall individual farmers change their production practices and their enterprise organizations so as most quickly and profitably to take advantage of new technology? But to the degree that our research at this level moves into successful application, farmers find their surplus position in the

market worsening. So the cry goes up, at the policy level, how can we turn off technology until demand catches up?

But technology has other market implications. Technology on the farm and in processing and marketing become increasingly intertwined. This makes possible higher quality in many products, and it makes control of quality at the production level cheaper than quality selection by grading in the open market. Hence, it encourages closed-market arrangements—contract production, “integration”—with all that this implies in terms of farmers’ access to market outlets, and in terms of breakdown of traditional competitive pricing.

Meanwhile, turning again to the farm level, technological progress seems commonly to imply increase in scale—farm enlargement, both in land and in capital investment—fewer and larger farms. But can farmers generally amass the capital needed for modern, efficient farming without devising new ownership arrangements? And what of those who cannot make the change—the technologically underemployed? Or of the personal and community dislocations involved when technological progress swells the flow of human resources to a flood? Can we, in short, learn how to “economize” the rate of growth through technological change in agriculture and related industries, both in terms of determining optimum rates, costs considered, and in terms of more equitable incidence of the resulting gains and losses?

Technological change and its impact is a problem complex that does not seem to be adequately encompassed by breaking it down into its farm management aspect, its marketing aspect, its price-support aspect, its farm-finance aspect, its low-income-farm aspect. We need new orientations towards the problem, new handles for taking hold of it, if we are to understand what is happening to us in a way that will enable us to deal with it intelligently.

The changing pattern of agricultural-industrial relationships is a related problem area requiring new approaches. Suburbanization of cities, decentralization of industries, the spread of highways and airports, the flight to open country for recreation, all are impinging upon the rural-farm countryside and the rural community. Urban and industrial uses of water resources are likewise competing increasingly with agricultural uses. Industry also competes increasingly for hired farm labor—at the same time that it seems to offer a less-than-perfect market opportunity for surplus farm-family labor.

Meanwhile, commercialization of agriculture brings not only increasing dependence upon industry for production supplies and equipment and for processing and distribution of products, but also increasing needs for capital funds from nonfarm sources.

In short, new patterns of competitive and complementary relationships between agriculture and industry are emerging, affecting not only resource use but also rural living patterns and community services. Here, again, is a set of interrelated problems that are not treated effectively as isolated pieces under the headings farm management, farm finance, land tenure, marketing, rural sociology. Here, again, new orientations are needed adequately to encompass the problem complex.

The committee report develops other examples. I will only list them here without elaboration: the market position of agriculture in an economy of abundance, where promotional competition is increasingly intense; the changing market relationships between agriculture and related industries in the milieu of modern business; the role of American agriculture in the world economy; changing needs and problems in the provision of rural facilities and services; and the implications of alternative goals for farm income and its distribution.

In addition, the report points to the need for integrated, systematic, and exhaustive treatises that will compile, examine, and appraise our present knowledge in various fields, the methods by which we conduct research in them, and the logic and systems of thought in terms of which we conceptualize our subject. Such studies, by giving us readier command over what we know, would be of great help in formulating and attacking new problems.

The committee does not claim an inclusive formulation of the problems facing the profession. It hopes only that its exposition of needs may be realistic enough to be widely provocative. For the problems themselves are not to be solved by a committee. Such a body can call attention to need, it can act as clearing house or focus for discussion of them, it can lend encouragement and support to efforts to meet these needs. But the efforts must come from the profession at large; they cannot be left to a committee.

Hence, my hope that our session this morning can develop into an imaginative interchange of ideas among all who are here on what the needs of the profession are and on how, as a profession, we can best go about filling these needs.

Your committee can try to help improve the market for ideas. But the ideas to be marketed must come from you.

NEW ARRANGEMENTS FOR DOING PIONEERING RESEARCH IN USDA

CARL P. HEISIG

Agricultural Research Service

INCREASINGLY in recent years, scientists, including social scientists, have recognized the need for devoting greater attention to fundamental inquiry into understanding of the unknown, or vaguely known, areas of human knowledge. This understanding of basic principles or concepts provides the underpinning for further advances in applied research. The ushering in of the atomic age has dramatized the importance of little-known and perhaps forgotten basic research of a former generation in making possible the startling advances of today. Legislators and the general public are now willing to agree with the scientists that basic or fundamental research has a significant role to play in the future of our society and is a justifiable use of public funds in a research program. Although perhaps most of them are more impressed with the needs in the physical and biological sciences, it is nonetheless true that the climate for more basic, longer term research even in the social sciences is more favorable than in most earlier periods.

Pioneering Research Concept

Basic or fundamental research is not new as a part of the research program of the Department of Agriculture or the Land-Grant Colleges. What is new is a growing recognition of its importance and a willingness to experiment and to adapt organizations and arrangements for doing more of it. In the Agricultural Research Service, this recognition of the need for more fundamental research and of the opportunity to expand its scope was crystallized by Dr. Byron T. Shaw, Administrator, in a memorandum dated May 17, 1957, in which he defined and authorized the establishment of Pioneering Research laboratories or groups in the various Divisions. Pioneering research "is not aimed at specific practical problems or objectives but rather at the advancement of science. . . . Such research will be undertaken to discover the principles underlying research areas and to develop theory which will greatly facilitate problem research as needs arise. It will be expected to build a foundation for the quick, effective and economic solution of research problems. . . ."

Although the question of what is basic or fundamental research is not merely semantic, efforts to define it precisely have often resulted in long, inconclusive argument, with much heat and little light. Attempts at precise definition of what is basic research in economics probably would be

even less conclusive than in most of the other sciences. The term "pioneering research" neatly avoids the necessity for precise distinction. The word "pioneering" aptly and uniquely describes the intended research. According to *Webster's Dictionary*, a pioneer is "one who goes before, preparing the way for others . . . one who explores in advance of others." Additionally, to quote Dr. T. C. Byerly, Deputy Administrator of ARS, "Pioneering research is more than exploration; the pioneer dwells beyond the frontier. He must not only survive there, he must establish the ways and means whereby others may join him and develop the area productively."

The need for such exploration and development of new principles and new approaches in economics is as great as or greater than in other areas. The challenge is to find the individuals capable of such exploration and to provide the proper institutional climate and continuous support for most effective results. Within the Department of Agriculture, the pioneering research group idea is intended to be the vehicle for realizing at least a part of these hopes.

Much, or perhaps most, basic research will continue to be done, however, as a part of applied research. The Department's research program will continue to be devoted mainly to the solution of current and anticipated problems of agriculture. The research program in economics will be no exception. But much basic research can and will be carried out as a part, or byproduct, of applied research. In fact, most research workers probably prefer to work in this way. They want the satisfaction of seeing their research contribute to the solution of current, practical problems. Their contributions to basic research are stimulated by and stem from work on applied problems. Then, too, there is greater certainty of early achievement and recognition from successful participation in the solution of practical problems. Recognizing these preferences, needs, and opportunities, we are in fact encouraging all of our various organizational units to give more emphasis to basic research problems. When basic problems of theory or methodology fall largely within the field of an established branch, individuals or small groups may be assigned to such research without setting up a formal pioneering research group.

Some scientists, however, may prefer to operate and may do their most effective work in a somewhat more detached setting, where they are given maximum relief from administrative and service chores and where the environment is exceptionally conducive to intensive, creative research on the frontiers of knowledge. Such an environment is intended for the pioneering research groups or laboratories. These groups may be visualized as a capital investment made today for the purpose of producing the practical research results of the future. The research scientists within the

groups will not be divorced from the practical world, but will have freedom and will be encouraged to consult with and work with their colleagues in applied research areas.

Organizational Design

In addition to providing an environment which places emphasis on basic research as the primary function, the pioneering research groups will permit the easier grouping of scientists from several disciplines or sub-disciplines into research teams. One of the seemingly inevitable results of large research institutions is the growth of a complex organizational structure with responsibilities for particular areas of research assigned to particular organizational units and with the consequent tendency to build disciplinary or intellectual fences between groups as a part of the organizational fences. One research administrator has stated that one of his major troubles is trying to mollify the research leader who complains that someone in another organizational unit has gotten an idea that he himself should have had. This problem can be easily overemphasized, but one of the criteria taken into account in selecting problem areas for pioneering research groups in ARS is whether or not it is of concern to more than one Branch in a Division or even of concern to two or more Divisions. The grouping together of several scientists from different disciplines in continuous day-by-day contact and with an interest in a common problem area is thus simplified when they are removed from the organizational compartments.

Each Division Director in ARS is responsible for the establishment of pioneering research laboratories or groups, subject to the approval of the Administrator, when he can define an appropriate research area, provide the necessary funds and facilities, and find one or more scientists of demonstrated ability and performance who are willing and able to undertake pioneering research in the designated area. To date, 15 pioneering research laboratories or groups have been established in ARS, most of them at Beltsville or in the regional utilization research and development divisions. The 14 laboratories in the physical and biological sciences are doing basic research on plant nutrition, physiology, and virology—plant fibres and enzymes—seed proteins and the allergens of agricultural products—animal genetics, animal proteins, blood antigens, and cellular metabolism—insect physiology and pathology—and the chemistry of microorganisms. The other and the most recent one approved is in the Farm Economics Research Division in Washington, D.C., which I shall discuss later. So far, the Agricultural Research Service is the only agency in the Department that has adopted these arrangements for promoting basic research.

Each pioneering research group is given a charter to carry on basic research within the limits of a fairly broad assignment. A small group of co-workers with a designated leader is responsible for planning, direction, and prosecution of their research program. They have maximum freedom for conducting their research and are responsible for the results obtained. They are relieved of the usual agency chores and freed from responsibility for meeting service requests. By administrative direction, the use of scientists in these groups to meet emergency needs or short-term efforts is limited to consultation.

The duration of a given charter is indefinite. Some will probably continue for many years or a lifetime. Others may reach a satisfactory state of completion after several years, particularly if a group has been brought together with a rather limited objective and where the individual scientists may wish later to return to applied research problems. Or, after a few years, the research results may lead into a related area that looks promising, or may require a different group of individuals with a different set of skills. The charters and organizational arrangements are intended to be flexible and adaptable to providing the maximum freedom to follow where the research trail leads.

Experience under Bankhead-Jones Act

As I indicated earlier, efforts to provide for the better conduct of basic or fundamental research are not new in the Department of Agriculture. But the problems are more difficult in a publicly supported institution than in a privately endowed university or a private foundation, and the hazards are perhaps greater. A brief look at the history of research under the Bankhead-Jones Act of 1935 may be appropriate.

As you may remember, title I of that act authorized the Secretary of Agriculture to conduct scientific, technical, economic, and other research into the laws and principles underlying basic problems in agriculture in its broadest aspects. Funds were provided for direct expenditure by the Department of Agriculture and a larger sum was available for allotment among the Land-Grant Colleges.

The annual report of the Secretary of Agriculture for 1936¹ relates some of the important reasons for this then new approach to doing basic research in the Department-Land Grant College complex and to the hoped-for removal of certain difficulties that "have tended to hamper free and full coordination of projects and to discourage certain basic studies." One important drawback mentioned was "the allocation of research funds item by item, on a bureau basis, for objects sharply particularized."

¹ *Yearbook of Agriculture*, 1936, U. S. Department of Agriculture, Washington, D.C., pp. 82-90.

Another was the tendency to separate the research work into "water-tight compartments." Still another was the budgetary requirement to tell in detail to administrative officials and Congressional committees what specific research results were expected from a particular budget increase request. The new Bankhead-Jones approach was conceived of as offering many advantages in terms of greater flexibility to coordinate and support basic research. Longer-term projects could be pursued with more assurance.

The method worked well for a few years. But during the war years, basic research was curtailed, partly because of the emphasis on applying research findings to emergency problems and partly because funds were not increased to keep pace with the declining value of the dollar. Finally, in the budget reshifting after World War II, the special research fund was merged with other funds and disappeared from the Department budget as an identifiable item.

Nevertheless, much significant fundamental research was accomplished. In the natural sciences, beginnings were made in several of the areas now marked out for pioneering research laboratories. In the social sciences, path-breaking research was carried on in interregional competition in agriculture, in input-output relationships in feeding livestock, and in crop insurance.²

We hope that the organizational design for pioneering research groups will be more enduring and will avoid some of the difficulties encountered in dealing with the Bankhead-Jones Special Research Fund. The generally more adequate support of research in recent years and the growing recognition of the need for devoting a larger portion of the research budget to research on fundamental problems fortifies the belief that these hopes will be realized. The pioneering research idea can be the vehicle for accomplishing it. Some evidence of the importance attached to this development is a resolution adopted in 1957 by the Agricultural Research Institute of the National Research Council commending the USDA for establishing pioneering research laboratories and referring to this action as the single most significant step in decades to promote the welfare of the fundamental elements of agricultural science.

How well these hopes will be realized will depend upon how vigor-

² A few of the publications from this research include:

Mighell, Ronald L. and Black, John D., *Interregional Competition in Agriculture*, Harvard University Press, Cambridge, Mass., 1951.

Jensen, Einar, Woodward, T. E. and Associates, *Input-Output Relationships in Milk Production*, U. S. Dept. Agr. Tech. Bul. 815, 1942.

President's Committee on Crop Insurance, *Report and Recommendations of the President's Committee on Crop Insurance*, House Document No. 150, 75th Congress, 1st Session, 1937.

ously we seize upon the opportunities made available, upon consistent adherence to the principles established, and upon the competence and performance of the research scientists who man the pioneering research groups.

Pioneering Research in Economics

In the field of economics, only one charter for a pioneering research group has been proposed and approved so far in ARS, to be concerned with what we have termed "Interfirm integration in farming." These words were chosen in an attempt to describe and circumscribe a broad area that logically could be included in the area of responsibility of the Farm Economics Research Division of ARS. We were thinking primarily about the growing developments and problems revolving about contract farming and vertical integration in agriculture. We will focus our attention on the relationships involving the farm as an integral part of a larger process. Emphasis will be on the development of an improved framework of theory, and the devising of basic methodology of analysis.

The interfirm relationships beyond the farm will be of special interest to the Agricultural Marketing Service and other agencies. But here again, no sharp line of distinction can or should be drawn between the several agencies interested in economic research on integration problems. We have developed and expect to maintain close contact with others working on related problems.

Our pioneering research group on interfirm integration in farming was established only recently and is not yet fully staffed, so no results can be reported as yet. The professional staff will include as the group leader Ronald Mighell, whose primary interest and accomplishments have been in the field of farm management and economics of production; L. A. Jones, whose field of interest has been in agricultural finance and credit; and Frank Maier, whose primary interests have been in land tenure and land economics problems. We believe that these three, with their specialized competence in three subdisciplines of agricultural economics and their broad training and experience, should provide an effective and promising team. The group is in the process of developing its own program and approach, with the help of several outstanding members of the profession we have brought into Washington as consultants.

The Pioneering Research Group on Interfirm Integration in Farming will try to do three things:

- (1) Bring together and develop a theoretical framework relevant to interfirm integration.
- (2) Develop basic methods and procedures applicable in a broad program of research in interfirm integration.

(3) Conduct some empirical studies to test theory and aid in developing procedures.

Integration is occurring under a variety of circumstances with many complex ramifications. Appropriate theory is needed to help researchers and others think more clearly concerning problem areas and points at which research should be directed.

Development of this theoretical scaffolding may well start with a reconsideration of the theory of the firm. But this theory may need to be broadened to encompass a system that extends from production firms backward into supply firms and forward into marketing firms. An entirely new conception of the structure and the loci of the functions of decision-making, risk-taking, resource-managing, and technology-controlling may be in order. Just as with the elucidation of the theory of monopolistic competition some 25 or 30 years ago, so today a reshaping of the theory of the firm may open up new avenues of progress.

A step in building a theoretical framework may be the development of suitable classifications for various types of interfirm arrangements. Such classifications should relate to the purposes served, such as control of capital and credit, quality management, and extension of technology. They should provide also a basis for examining the forces from which integration originates and for appraising any changes in relationships among the participants in the production-marketing chain.

Another significant step in theory has to do with the dynamic patterns of long-run changes in interfirm structure and operation. Is contract production a passing phase? Some revolutionary changes have occurred in broiler production. These changes are still going on. Where will they end? Answers to these questions require further analysis of why integration develops and the functions performed at various steps in the integration process. Studies of comparative dynamics for a number of commodities may lead to some conclusions that can be generalized.

Attention will be given to the development of appropriate procedures and models for attacking specific problems. For example, a frequent question is, "What is the effect of vertical integration on aggregate output?" Developing theory and methods for measuring this effect and testing it empirically may be regarded as pioneering research. But the final task of carrying out a large aggregative project may be considered applied research.

The FERD Pioneering Research Group will conduct some pilot studies to help in the process of theory formation and in building procedural methods and models. Other projects carried on simultaneously elsewhere in the Division will also contribute to this end. We have already initiated such studies in three of our Branches. They have to do with vertical in-

tegration in the production of hogs, eggs, and sugar beets. Also, we have arranged with the University of Iowa Agricultural Law Center to conduct a national study of the legal aspects of farm production contracts. The pioneering research group is thus a part of a larger program, somewhat detached but not isolated from the applied research activities. We hope and expect that it will experiment with and pioneer in developing new principles and procedures for obtaining a fundamental understanding of integration developments in agriculture which can, as a minimum, form the foundation for doing more meaningful research in the future.

Summary

The general climate for doing basic longer term research, including research in the social sciences, seems more favorable than in most earlier periods. The pioneering research concept is an organizational design for stimulating progress in basic research by encouraging the selection of individuals suited to exploration beyond the known frontiers of science and by providing them with an environment detached from administrative routine but not isolated from contact with practical affairs. This is only one of several ways of conducting basic research, but it is one that we believe has some promise and warrants our full and sustained support. One pioneering research group in economics has been established on the problems of interfirm integration in farming. As we gain experience with the arrangements embodied in the pioneering research approach, we shall want to consider establishing additional groups to conduct basic research on other important economic problems of agriculture.

DISCUSSION: ENCOURAGING FUNDAMENTAL RESEARCH IN AGRICULTURAL ECONOMICS

GEORGE K. BRINEGAR

University of Connecticut

Heisig and Southworth are to be congratulated on two counts: first, for their reports on "Pioneering Research in the USDA" and on the "AFEA-SSRC Committee;" and second, for supplementing and enriching their reports with other materials. My discussion is intended to elaborate on their other materials, rather than to comment on these excellent reports.

My first comment bears on both papers and the concepts of fundamental research they suggest by inference. Southworth states in his next to last paragraph "Hence, my hope that our session this morning can develop into an imaginative interchange of ideas among all who are here on what the needs of the profession are and on how, as a profession, we can best go about filling these needs." Heisig states "Although the question of what is

basic or fundamental research is not merely semantic, efforts to define it precisely have often resulted in long, inconclusive argument, with much heat and little light. . . . The term 'pioneering research' neatly avoids the necessity for precise distinction. The word 'pioneering' aptly and uniquely describes the intended research. . . . A pioneer is 'one who goes before, preparing the way' . . . " These statements suggest that our interest in this session, and the interests of the groups reported upon, should be on the research needs of agricultural economists—call it fundamental if you wish.

What are the research needs of agricultural economists—or what does the agricultural economist want from the agricultural economists' agricultural economist? Following this question the next one becomes that of inquiring into who can be expected to pay the economists' economist.

What does the agricultural economist want—excluding as illegitimate his childish, but understandable, wish for the little black book containing all the answers? The need I have most often heard expressed centers upon the desire for a more adequate means of drawing upon the body of knowledge accumulated in the past relevant to the activities of agricultural economists. Specific statements of this need take many forms and imply many different sorts of materials and services. At one pole is the request for more adequate bibliographies—next is the request for a tax-service type of reporting on matters economic—next would come the encyclopedia of agricultural economics—next is definitive volumes on specific areas within agricultural economics—last, is the Smith, Mill, Marx, Marshall and Keynes type images of the economy.

The second type of need receiving frequent expression is of a more sharply focused nature, though perhaps one involving a major element of wishful thinking, such as adequate theories of (1) technological change, (2) dynamics, (3) supply, (4) demand, (5) welfare, (6) decision making, etc.

A third type of need concerns subject matter that has traditionally been defined as beyond the field of agricultural economics, involving such subjects as statistics, psychology, etc.

Lastly, a need is often expressed for what may be called, in want of a more adequate term, a "consulting service." A specific illustration of this need is how to get a manuscript carefully reviewed on other than a personal basis. Perhaps more important is, how can a person get his ideas tried out and tested a bit before they are in manuscript form? A further problem is simply that of how to get good advice.

If the above mentioned items are to be made available by persons acting in the role of the agricultural economists' agricultural economist, how can these people be paid and recognized for serving the profession? The first part of the answer is: In the same ways as in the past. Thus we can expect a major share of the time that is provided for these purposes to be the side

activities of the persons involved. This is as it should be, though the importance of this type of activity might well be emphasized to both agricultural economists and their employers. Support for some aspects of this type of activity is now directly provided for in the USDA, in the Land Grant colleges, and in other institutions. The USDA does a magnificent job in providing useful statistical data and other materials for the use of agricultural economists and others. It is imperative that this continue and be strengthened. However, it is clear, I think, that the profession has specific needs that are not being met—not because no one has the ability to do the required jobs—but simply because the meeting of these needs does not fall within the recognized responsibilities of any existing groups.

I hope that our group here, as well as the groups reported upon by Heisig and Southworth, will look into the problem of how to develop more ways of providing needed services to the profession—ourselves—not forgetting that the needs of the profession are much broader than the ones usually conceived of as fundamental research, but are truly that of “preparing the way.”

My second comment is the belief that the greatest need of our profession lies in the area of integrating and fitting all the pieces of our knowledge together so that our research efforts will cumulate faster—in brief, speed the rate of growth in knowledge—one form of capital cumulation, based on raw material drawn from an inexhaustible mine.

DISCUSSION: ENCOURAGING FUNDAMENTAL RESEARCH IN AGRICULTURAL ECONOMICS

FREDERICK V. WAUGH

Agricultural Marketing Service

After listening to many discussions of fundamental research, I have come to the following conclusion: No one knows what fundamental research is, no one knows how to do it, but everyone says we should have more of it.

Mr. Southworth and Mr. Heisig have wisely avoided any attempt to make an exact definition of fundamental research. Instead, Mr. Southworth has told us about the need for “reorienting research” and Mr. Heisig has told us about plans for carrying out “pioneering research.” In my opinion, both of these papers are excellent. Whatever name you give it, the kind of research Southworth discusses is vitally important. And the kind of pioneering-research unit discussed by Heisig has great promise.

Mr. Southworth has given us a very interesting report on progress of committees appointed by the Social Science Research Council and by the American Farm Economic Association. These committees have tried to

identify some of the main economic problems that will be confronting agriculture in the future and that will need research answers. I agree that the areas of work identified by these committees so far are all extremely important. I agree that more of our research effort should be devoted to finding answers to these problems.

Of course, as Mr. Southworth says, no list of problems will ever be complete. I would suggest attention to at least one area that is not listed. I think we need a great deal more research concerning the role of government in agriculture. This would include, for example, the kind and size of programs we should have in such fields as agricultural production, marketing, prices, storage, foreign trade, and surplus disposal.

I think the members of our Association should realize the importance of the work done by the SSRC to advance the frontiers of knowledge in agricultural economics. When I was just starting in this profession, Professor John D. Black was writing his series of SSRC reports on "Scope and Method." These reports have had a profound influence upon the development of scientific work in agricultural economics. Since the Scope-and-Method series was published, several committees of the SSRC have continued to explore the need for new kinds of research to meet emerging problems in agricultural economics. I have the feeling that the work discussed by Mr. Southworth will soon result in recommendations that can and should point the way to a new era of progress in our field.

Mr. Heisig has told us about the plans for pioneering research in the Agricultural Research Service of the USDA. I agree fully with him that the economists in the USDA need to give more attention to theory, principles, and concepts. I agree that the pioneering research units are well worth trying. Further, I am glad to see that at least one such unit has been established in the field of agricultural economics.

The problem of "interfirm integration in farming" is important and is well worth special attention by competent economists in the Department. In this case at least, the Department seems to be following along lines similar to those followed by the committees of the SSRC and the AFEA. That is, a unit has been set up to study specific problems believed to be important. I am much in favor of this approach even though it may run counter to some prevailing notions on how to conduct fundamental research.

In this connection, Mr. Heisig quotes from a memorandum defining and authorizing the pioneering research laboratories. The first part of the quotation says that pioneering research "is not aimed at specific practical problems or objectives but rather at the advancement of science." It goes on to say that "it will be expected to build up a foundation for quick, effective, and economic solution of research problems."

To me these two parts of the quotation seem somewhat contradictory. The first part represents a common point of view concerning the so-called "fundamental" work in many different areas. For example, Mr. Boyer has a paper¹ in the current issue of *Science* on the intriguing title "Mathematical Inutility and the Advance of Science." He gives many examples supporting the view of Hadamard² that "practical application is found by not looking for it."

Emily Dickinson said the same thing about beauty or art when she wrote:

Beauty is not caused—it is;
Chase it and it ceases,
Chase it not and it abides.

Henry Ford³ meant the same thing about business when he testified in a court case: "The best way to make money in business is not to think too much about making it."

As near as I can make out, all these people are advising us that if we want to do really basic or fundamental work in any area, we should give no thought to the actual problems of the real world. Rather, we should avoid these problems and think deep and beautiful thoughts.

I wonder whether this is really good advice. I suspect that Mr. Ford actually tried to make money; I suspect that Emily Dickinson polished up her poetry to make it more beautiful; and I doubt Mr. Boyer's assumption that Fermat invented the differential calculus and helped to invent the science of probability with no thought of practical application.

Anyway, I think we will make the best progress in agricultural economics if we look for ways of solving some of the actual problems confronting us. Of course, this calls for thorough and careful work in theory, principles, and concepts. But I do not think the advancement of science comes from purely abstract speculation alone. In my opinion, theories and principles are good only if they help us understand what actually happens in the real world. I believe that the advancement of science is measured by our improved ability to understand the world and to solve real problems.

I think that the pioneering research units discussed by Mr. Heisig have great possibilities. Like anything new, they may also have some dangers. The main possible danger I see is that of insulating the pioneering economist from actual problems. I agree with Heisig that to do good pioneering research, the economist must have a reasonable amount of time free from administrative chores. But Mr. Heisig also says that they should be en-

¹ C. B. Boyer, "Mathematical Inutility and the Advance of Science," *Science*, 130:22-25, July 1959.

² J. Hadamard, *The Psychology of Invention in the Mathematical Field*, p. 124. 1945.

³ William C. Richards, *The Last Billionaire: Henry Ford*, Scribner, Montreal. 1936.

couraged to consult with the administrators of programs. This consultation I think is extremely important. I think the pioneering economist should spend a fairly substantial portion of his time in the field and in consultation with officials who conduct economic programs. He needs to be alive to the emerging issues in agricultural economics and agricultural politics.

In closing, I repeat that both of these papers are excellent. They point the way to a substantial advance in the science of agricultural economics.

AGRICULTURAL DATA REQUIREMENTS FOR RESEARCH

Chairman: Kenneth L. Bachman, Agricultural Research Service

STRUCTURAL CHANGES IN AGRICULTURE AND RESEARCH DATA NEEDS

PHILIP M. RAUP

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I. Introduction

THE focus of this discussion will be upon the nature of current and anticipated structural change in American agriculture, and our resulting needs for research data. Cast in this form, the topic stresses structural change, and research. The nature of the structural changes contemplated will emerge from the discussion that follows.¹ Before proceeding with that discussion it is in order to pause and ask what expressly is meant by the term "research data?"

In the evolution of data systems we can note three broad trends in the functional uses to which data have been put: A ministerial function, a trade function and a research function.² Historically, the initiative in data collection has rested almost exclusively with governments and ministerial officials, faced with an immediate question: What to do? This ministerial function, with its orientation towards central governmental action, continues to the present day to be a strong impelling force in the systematic ordering of current statistics. Somewhat later in history we can detect the emergence of an interest in data assembling on the part of trade

¹ In preparing this paper suggestions were solicited from users of agricultural data in academic and governmental fields, and in private business, trade and professional associations. Much of any merit that the paper may possess must be ascribed to the embarrassment of riches contained in the thirty-odd thoughtful responses. To list names would be presumptuous for with a few exceptions the individuals involved have had no opportunity to review the paper in its present form. Where explicit credit is due, an appropriate citation has been made in the footnotes. The author is particularly indebted to the following individuals whose comments and suggestions on a near-final draft have measurably strengthened the argument: Sherwood Berg, Willard Cochrane, Darrell Fienup, Virgil Hurlburt, Elmer Learn and Walter W. Wilcox.

² The term data systems is used here to mean the full complex of statistical gathering and ordering efforts, at local, state or federal levels of government. It includes the collection of data by non-governmental trade and professional associations to the extent that these data are published and made a part of the public domain of economic information.

and commercial groups, merged at times with the ministerial function in eras when government and business were less distinctly separated than they have become in the western world. In the ministerial tradition, the Egyptian and Roman censuses stand out, as do the *Domesday Book* of William The Conqueror, and the data assembly apparatus of the Ottoman empire. In the trade tradition William Petty's *Political Arithmetic* is a classic example of the emergence of an interest in data for their usefulness in commerce.

It is only in recent times that we have witnessed the development of a "research" interest in data on the part of a professional group of data-interpreters, including, but not limited to, economists and statisticians. The term research in this setting is used to indicate the process of posing questions or hypotheses in a form that permits them to be subject to test, followed by the systematic assembly of data designed to promote this testing process. The distinguishing aspect of this interest in data arises from the fact that the data users are not in general faced with the necessity of an immediate decision in a problem setting in which action is imperative. It is this research interest in agricultural data that will be uppermost in mind in the discussion to follow.

It is important to point out that research workers are not the only, nor in some cases, the most important users of research data. We can identify the interests of administrators, the business world, and of educators and agricultural extension workers in the good health of our agricultural data system. We as research workers too often regard it as our private property.

One of the theses that will infuse this discussion rests on a conviction that we have defined research interests in agricultural data too narrowly in the United States. Economists, statisticians and agricultural technicians operate the systems by which data are collected. They are guided by the counsel of their professional colleagues when making any change. To an important extent, the sociologists, the political scientists, the historians, and a wide range of interested data users are on the sidelines of most agricultural data discussions hoping for some crumbs from the table but largely excluded from an opportunity to influence the outcome. As the custodians of the agricultural data estate, we need constantly to remind ourselves that we have obligations beyond the boundaries of our professional fields.

An explanation is also in order regarding the use made of the term "structural change." By this I refer to the economic consequences of forces manifested primarily outside of or "above" the level of the firm. Included are changes in the number and size of operating units in agriculture, the relations among firms, their position with respect to government and the public, and the economic and social status of the men that

are employed in them. While some of the important changes described below are the result of shifts in the internal organization of firms, it will be the extra-firm consequences of these changes that will be of primary interest.

II. Some Structural Changes Now Under Way

What are some of the structural changes that we can anticipate in American agriculture, and what are their implications for our research data needs? One of these changes is scarcely a matter of anticipation; it is already upon us. It involves the compelling necessity to distinguish between the "firm" and the "plant" in our analysis of agricultural enterprises. No distinction of this type has been necessary in the past for the firm and the plant were identical over a decisive part of American agriculture. In many areas this is still the predominant situation. The identity can no longer be taken for granted, however, for it has been seriously disturbed by the erosion away of the economic boundaries that once clearly defined a farm unit. This erosion extends backward in the production process to the suppliers of production needs, blending their identity with the identity of the actual land-using farm firm. The erosion also extends forward, to include processing and marketing activities. Many of these activities were once part of "agriculture," were subsequently defined out of the field, and are now tending to blend back into the farm production picture through contractual relations between processors or marketing firms and raw material producers.

One result is that in major sectors of American agriculture we can no longer speak unambiguously of the farm firm. If we stick with traditional definitions of the term, there are several firms in the complex. A more realistic approach would be to adopt the terminology of the "firm" in its industrial setting, under which we can identify a relatively small number of firms, controlling many individual producing plants. In important agricultural sectors the farm of today is well on the way toward the status of a "plant," in the industrial use of the term.

The implications for our agricultural research data needs are that we do not now have clear definitions of the number or the function of decision-making enterprises in agriculture. The number of firms is smaller than the number of plants, but we have no clear idea of the partition of control among them.

At a policy level, this deficiency in our present data carries a serious consequence: It is a reasonably simple matter to identify and measure the relationships that can lead to an estimate of the optimum size of plant in an engineering or production-economic sense. No similar simplicity or

common ground of agreement exists regarding the data needed to enable us to identify the optimum size of "firm."⁸

Looking to the future, we can anticipate a need for more adequate data to enable us to classify the relations among suppliers, producers, and marketing agencies on the basis of their contractual arrangements. The data now available will not permit us to develop a sharply conceived and measurable definition of an agriculture "firm" that is usable for analytical purposes. There is a wide range in the independence with which present producers can act in the purchase of supplies, in the selection of enterprises and production processes, and in marketing decisions. Some firms in agriculture still approximate the model firm under conditions of atomistic competition. Others are deeply enmeshed in a web of contracts that moves them well into the field of oligopolistic competition, and the trend shows signs of continuing to run strongly in this direction. With our present data we are unable to note these differences, or to appraise the significance of current trends.

A second structural change that is already upon us involves a similar blurring of the distinction between the operating unit and the ownership unit in agricultural production. As is the case with the "firm" and the "plant," there has been in the past no great need for distinction between these concepts; they were identical. Where they have existed as separate units, it has been our tradition to regard this phenomenon as a transitional one in the process of inheritance and progress up the "agricultural ladder." Events of the past few decades raise serious questions about the validity of this traditional reason for ignoring differences between operating and ownership units. We have seen a continual increase in the number of part-owner operators, and in the area of land operated by them. We can note the persistence of a hard core of high and stable tenancy in the heart of the Corn Belt; since World War II there has been a persistently significant fraction of total farm land sales made to non-operating owners. All of these trends attest to the increasing need for a distinction between ownership and operating units in our agricultural statistics.

The collection of data on ownership units is difficult. An ownership census on a periodic base would be prohibitively expensive if not outright impossible in the United States because of the variation in ownership law, practices, and traditions among our states.

It is not out of reason to propose a systematic effort at the collection of ownership statistics on a sample basis, and at time intervals sufficiently short to permit the reporting of major structural change while it is under-

⁸In the industrial sector, a similar observation has been made by H. A. Simon and C. T. Bonini, "The Size Distribution of Business Firms," *Amer. Econ. Rev.*, Sept. 1958, p. 613.

way. Without these data we will be unable to determine who are the "beneficial owners" of agricultural assets, or to appraise the ultimate incidence of agricultural programs.

Without a significant alteration in our present agricultural data resources, the two structural changes outlined above will go largely unreported, and can be expected to serve as a continuing base for uncertainty and controversy.

A third type of structural change also involves a loss of distinction in once clearly defined units of observation. This results from growth of part-time and residential farms on the one hand, and a parallel growth of rural residential non-farm users of land, on the other. Part-time and residential farms accounted for over one-third of all farm units in 1954; if the data collected in the agricultural census of 1959 permit any comparison with this figure (and at this writing the probability is that they will not), we will almost surely witness a significant increase in this proportion.

While many observers have been quick to point out that these part-time and residential farms contribute little to total agricultural production, two qualifications must be made: The income of farm people from non-farm sources has ranged from 30 to 45 per cent of the total income of farmers in recent years. At some point in the progress of this trend we must re-examine our concept of the part-time farm. We now have very imperfect information regarding off-farm income, although explicit efforts have been made by some research workers to promote the collection of these data. With the exception of isolated local studies, we have virtually no information, for example, as to where people work who work off farms. To take only one example, data of this nature will provide a significant improvement in our current estimates of the opportunity cost of farm labor inputs, together with a rough indication of the qualitative levels of the non-farm skills and employments open to farm people.

A second qualification relates to the fact that, although residential non-farm users of rural land may contribute little to total agricultural output, they do constitute a significant fraction of total rural land use. Shifts in land use from farm to rural residential categories, across the face of the country, are one of the major impacts of the urban fallout from the exploding metropolis. This is occurring in areas surrounding our major metropolitan centers, including some of the most intensively used and highly valued agricultural lands of the United States.

Our present data resources provide little information regarding this structural change in land use, and they will provide us less in the future. We will apparently be unable to identify the types of land use exercised by rural residential users outside of corporate areas, nor will we have

estimates of their number, or of the acreages of land they occupy. These will be the consequences of the changed definitions of a farm to be used in the 1959 census, and of the enumeration practices followed.

The resistance to data collection on rural non-farm users of land unquestionably stems from the production orientation of our present agricultural data series. These rural non-farm land users do not contribute significantly to agricultural production, ergo, drop them from the series. This is a seriously short-sighted view of the functions of agricultural data, and of the problems faced by rural people, both farm and non-farm. Parallel with the rapid growth in the concept of metropolitan area planning, and the consequent inclusion of large acreages of farm land in metropolitan areas, we are also witnessing a rapid growth in the application of the planning process in rural farm areas. This growth is still in its infancy, but it has taken significant strides in major agricultural areas, among them the Pacific Coast, areas adjacent to the central industrial belt along the southern boundary of the Great Lakes, and in the northeast. At a time when rural people are suddenly awakening to the importance of planning and land use guidance, we are systematically reducing the flow of the kinds of data that are essential for a basic development of this planning process. The impact of this structural change is enormous, and a progressive choking-off of basic planning data will have far reaching consequences, for agriculture and for the economy as a whole.

This choking-off of data flows on part-time, residential, and rural non-farm users of land is but part of a more pervasive development that has characterized our agricultural data in recent years. Rising costs and the critical attitude of Congress toward appropriations for data-collection have led to the virtual disappearance of systematically collected data on local areas. To understand the causes for this development it is instructive to reflect a moment upon the decision-making process by which agricultural data series are extended, maintained, or curtailed.

The most vocal and influential users of agricultural research data are located at the national level, with a second level of professional support extending down to research workers at the state level and state representatives of national agencies. Viewed from the Nation's Capitol there are many occasions when the refinement of statistical data calls for nothing smaller than one figure or one estimate per state. At the level of central government and for a number of purposes, one figure per state is too much detail; regional or combined economic area totals are all that is necessary. The sense of this statement can be boiled down to a single sentence: There are few users of county or minor civil division data in Washington.

In parallel fashion, the increasingly sophisticated treatment of agricul-

tural research data made possible by machine analysis and our improved levels of statistical and economic theory have led key agricultural economists to concentrate on aggregate data, on national trends, and on the macro level of economic analysis. Some of the best brains in the profession are explicitly uninterested in local problems. The national stage is a better place to make a national reputation, and the fascinating potentials provided by machine processing of data are often inapplicable to the problems of areas smaller than a state. As a consequence, when something has had to be sacrificed, data on a minor civil division and county level were the first to go. This process has now largely eliminated usable data on any dollar magnitudes at the county level, will apparently results in the elimination of Economic Area data in the 1959 census, and is well on its way toward a serious undermining of some types of data at the state level.

Two important consequences can be expected from this trend: The progressive elimination of local data will exercise a pervasive centralizing influence on our conception of problems, and on our research. One way to guarantee a progressive weakening of local responsibility is the denial of essential data required in day-to-day decision-making at the local level by public agencies, private firms and individuals. One of the ironies in the American political scene is that many of those who decry the growing power of central government are also the ones who fail to support the systematic collection of economic data at the local level.

The importance of this trend is compounded by a second development. The diversity among agricultural production enterprises is increasing, not decreasing. We are witnessing area specialization, specialization at the firm level, and widening spreads in farm income distribution, patterns of land use, and intensities of agricultural capital investment. In short, the structure of American agriculture is becoming less homogeneous, and our data sources that would enable us to identify and analyze local variations in these trends are drying up.

The users of local data are poorly organized, have widely varying interests, and are largely unrepresented in the counsels of central data collection agencies. My concern about this trend arises from a belief in the economies of scale in agricultural data collection. In spite of the reduction in numbers of farms, and increases in their size, agriculture is still characterized by firms that in general are too small to afford the investment in data collection now made by private industry in the non-farm sectors. This is likely to remain a characteristic of American agriculture in the foreseeable future. While the poultry industry, animal feed suppliers, or other selected segments of agriculture may eventually develop data collections systems of their own, it is highly questionable in my mind that this will represent progress.

III. Some Impending Structural Changes

The structural changes that have been outlined above are clearly visible. Less visible but no less important are some structural changes that seem impending in American agriculture but about which there is current controversy and sharp difference in prediction. One of the most significant of these possible developments involves the prospect of a gradual shift toward an administered price basis for American agriculture. For several decades the supply of our food and fiber requirements has increasingly assumed some of the characteristics of a gigantic public utility. The consequences of many current proposals for change in our agricultural price and income policies would propell us farther in this direction. In this setting, and if these trends continue, we will almost surely witness the emergence of agricultural pricing policies in which equity considerations and the determination of "fair" returns to agricultural producers will play the dominant role.

If we take this direction, and the prospects are strong that we will, the implications for agricultural data collection are great. It seems fair to say that we do not now have adequate data for the accurate determination of returns to labor and capital or of real costs of production in large segments of agriculture.⁴

Several examples of these deficiencies will illustrate the point. We still count tractors by the "head," and the factors used to convert these simple count data to horsepower hours of input are of the crudest possible kind. Data are largely lacking on the power resources available to American farms in the form of electric motors. Depreciation schedules for machinery and equipment are schematic and have been constructed at rates that reflect income tax practice rather than actual user experience. They are associated with an almost total lack of any data regarding the market for used farm machinery.

A similar aura of unreality surrounds the estimates of the input of land and buildings. Estimates of the value of farm buildings are extremely crude, reflecting a mixture of valuation processes involving capitalization at current opportunity cost rental rates, estimates of replacement costs, and "unit rule" estimates derived by valuing the farm as a whole with and without the building component. Where animal products feature prominently in agricultural output this defect in calculating the building component in costs of production is alone large enough to guarantee serious error in any cost-of-production estimation.

There is still another sense in which our current data on agricultural inputs are defective. Technological trends in several livestock product

⁴This point was emphasized in correspondence from several agricultural data users, including Zvi Griliches, Vernon Ruttan and George Seferovich.

sectors of agriculture have involved the purchase and use of heavy and expensive items of equipment that in general would be classed as personal property, that is, as movable, although in fact they are often identified with the real estate. Examples are bulk milk tanks, feed mixing and handling equipment, ensilage unloaders and conveyors, and in general an increasing fraction of all materials handling equipment. Some of this is not sold by the traditional agricultural equipment dealer, is not reported in conventional census lists of agricultural machinery on the farm, and frequently escapes enumeration completely in any listing of capital investment items.⁵ If enumerated, there is a continual problem of determining whether to reckon it with the fixed investment in land and buildings, or with the investment in movable farm machinery and equipment.

These are a few of the numerous examples of the confusing status of many manifestations of modern technology in agriculture. They underline what I believe to be an overriding fact: It will be impossible to introduce supply controls, with their attendant focus upon equity and real costs of production in agricultural pricing, without major refinements in our present agricultural data system. We need information in more detail, by smaller geographic areas, at more frequent time intervals, and with less lag in reporting.

These observations regarding the confusing status of data on agricultural inputs are but one aspects of a larger problem. It is becoming increasingly difficult to give a succinct answer to the question: "What is agriculture?" We have already seen how the concept of the farm in agriculture is blurring and losing analytical usefulness, in the form which our present statistics report it. We have observed too that data on the ownership unit in agriculture are not simple blurring, they are, practically speaking, non-existent. In a broader sense, the entire concept of "agriculture" is losing distinction. The business of supplying inputs to agriculture is being sliced away from the corpus of the farm unit, and increasingly identified as a non-farm business activity. Processing, transport, handling and other functions once a part of agriculture have been defined out of the field and taken over by the non-farm sector. We have only the foggiest notions about the extent of total economic activity devoted to the provision and distribution of our supplies of food and fiber products.

The estimates reported by Ronald Mighell and others indicate that the agricultural supply and processing sectors are at least as large in terms of employment provided as is the sector that we today identify as "farm." These developments have led to some foolishly optimistic conclusions regarding increases in the productivity of agricultural labor, they have promoted a dangerously unrealistic view of the growing unimportance of

⁵ This point was given particular emphasis in correspondence from George Seferovich.

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agriculture in the American economy, and they make increasingly difficult the identification of the "value added" by agriculture in the total productive process.

All of these consequences strike me as serious. One in particular appears to be dangerous. I am referring here to the naive interpretation of our current agricultural statistics to imply a rapid decrease in the importance of "agriculture" in American economic life. We are continually reminded that farmers are less than 12 percent of the gainfully occupied labor force, earn less than 8 percent of total personal incomes, and are destined to become an ever smaller fraction of the American economic scene. Statements of this nature are unbecoming in their simplicity; they ignore completely the interrelated dependence of the pre- and post-farm sectors, and they provide the non-farm sector with a view of agriculture that invites a parallel with a view of the world seen through the wrong end of the telescope. I am not promoting the development of agricultural statistics to achieve an optical enlargement of the agricultural sector. I do plead for its true rendition. Much of the blame for this inadequate view of the importance of agriculture in an industrial society must rest on the defects in our statistical data. The simple fact is we do not have the data that will give us a clear picture of the total employment generated and made possible by the business of providing us with our food and fiber requirements. We do not know the true scope of the market for goods and services provided for or generated by agriculture.⁶ In the interests of political and economic health this defect needs a rapid remedy.

As a consequence of the explosion of traditional "agriculture," we are witnessing the development of agricultural activity in the pre-farm and post-farm sectors that in their aggregate are now or will no doubt soon overshadow the narrow "farm" sector of total food and fiber activities. One implication for our research data needs involves the Census of Business, the Census of Manufacturing, and the increasing need for close working relations between our non-farm and our farm-sector data collection apparatus. Much that concerns agriculture is today or should be re-

⁶An example will illustrate the wide ranges in estimation now occasioned by our inadequate data on the importance of farm purchases from other firms. The U.S. Forest Service has estimated the use of new lumber in the construction of farm service buildings at 3.5 billion board feet in 1949 and nearly 4.0 billion board feet in 1952. (*Timber Resources For America's Future*, USDA, Forest Resource Report No. 14, Washington, Jan. 1958, p. 405). In a study for the Weyerhaeuser Timber Company, the Stanford Research Institute estimated new lumber consumption in farm service buildings at 977 million board feet in 1953. (*America's Demand For Wood*, Report to the Weyerhaeuser Timber Co., Stanford Research Institute, Tacoma, Washington, June 1954, page 207.) The Forest Service estimate is four times the Stanford estimate; the discrepancy of 2.5+ billion board feet in this single use-class estimate is equivalent to six per cent of total lumber consumption in the U.S. in 1952.

ported in the Census of Business or Manufactures; much that concerns rural land use is or should be reported in the Census of Population. In each of these sectors our coordinating effort requires improvement.

I have used the terms Census of Business, Census of Manufactures, and Census of Population to indicate the types of information that are increasingly required in agriculture. I would not like to leave the impression, however, that these data will be useful in the form in which they have traditionally been collected by Census efforts. The increased tempo of American economic life creates a demand for data that we would identify as "census type" but that are needed at more frequent intervals than has been traditional in the census taking process. We need better data on sales by suppliers to farmers, on depreciation rates, on inventory counts, on processing weights, on pricing by grade and quality, and similar data that are susceptible to collection by sampling procedures but are needed at frequent time intervals. In general these needs can be understood under the heading of "qualitative" improvements in our traditional agricultural data series.

An even more important area for qualitative improvement concerns the characteristics of farm operators themselves. With fewer and bigger farms, and with fewer individuals making key decisions in agriculture, it becomes much more important to understand their thought processes, their levels of information, the sophistication of their economic and analytical abilities, and the probable patterns of their response to price and related economic stimuli. Here it would seem to me axiomatic that we can no longer rely upon our traditional time series for adequate data. The lag in reporting is too great, the level of sophistication in collection is too low, and (probably of greatest importance) it will be increasingly dangerous to rely on "self-reporting" techniques of collection. I am referring here in particular to the traditional types of data reported under the general heading of "producers' intention to plant," or "producers' intention to market," and the like.

As firms become fewer, larger, and more highly integrated, data on intentions to produce or market assume the status of trade secrets. At some point in the process of integration there emerges a powerful incentive to withhold data, or to distort it in reporting.⁷ We may be approaching this point in several sectors of American agriculture.

IV. Conclusion

In retrospect, the title of this paper contains a misleading reversal of the emphasis that has been brought out in the discussion. The kinds of

⁷ In correspondence and discussion this point has been emphasized by J. K. McDermott and Willard Cochrane, among others.

agricultural data we decide to collect will influence the nature and the direction of structural changes. We can draw repeated examples from history to illustrate the fact that we tend to develop our concepts of problems in terms of the data or the measurement devices at hand. The traditional statement of the nature of scientific research involves the conceptualization of problems, the formulation of hypotheses regarding their causes, and the systematic assembly of data designed to promote their solution. Without denying the validity of this approach, it is well to remind ourselves that there are unquestionably external economies of scale in agricultural data collection. We cannot foresee all of the uses to which our data will be put at the time we plan for their collection. The whole is greater than the sum of its parts.

Investments in research data are a major contribution to the national stock of social overhead capital although they are not generally so recognized in totaling the wealth of a nation. There is disturbing evidence that in recent years we have permitted specialized interest groups to play a large role in the determination of the kinds of data that will be collected. We have retained the acreage of cucumbers and pickles and have dropped the reports of average age of farm operators, by counties. In the continuing fight for appropriations for data collection, in the Department of Agriculture, in the Bureau of the Census, and at state and local levels, we can expect pressure for tailored data to meet the relatively narrow needs of farm and non-farm businesses. It is more difficult to mobilize support for the collection of data that relate to structural change. The types of data called for in this paper are not prominent among those demanded by farm or industrial pressure groups. They represent in a sense the "public" interest in agricultural data. One of the challenges facing this Association rests in the necessity to support a broad concept of the purpose of our agricultural data effort. If we insist upon the collection of data tailored to explicit needs of the moment we will in the end find that we have failed to serve our own narrow interests and our profession as a whole.

DISCUSSION: STRUCTURAL CHANGES IN AGRICULTURE AND RESEARCH DATA NEEDS

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I understand my role to be somewhat different from that of the usual discussant. Rather than attempt to criticize Dr. Raup's paper, I understand I am to supplement his discussion from the point of view of the

rural sociologist. This I am happy to do since I have no quarrel either with the theme of the paper or with points my training allows me to evaluate.

The frame of reference of the discussion consists of those many areas of overlap between our respective disciplines. Obviously, this frame of reference omits a very large part of both disciplines.

The Census covers only two areas in which rural sociologists work. A very large share of the data for research in demography comes from Census volumes. A much smaller portion of research in stratification also is based upon Census data. Stratification research of this sort is largely limited to occupation, education, and level of living. This means that there is almost complete reliance upon primary data from field studies for research on groups, institutions, formal organizations, community and neighborhood, most collectivities, and communications. The results have been a mixed blessing. We have developed more intensive methods and content. But we have also been hindered in drawing generalizations for more than one county or economic area at a time.

Doubtless, part of this is due to failure of the sociologist to develop measures which were operationally feasible in census-taking. For example, when Dr. Margaret Hagood developed a method for measuring farm operator level of living for counties, such indices were thereafter included in volumes of the Census. However, the inclusion of the level of living index was influenced by more than its availability. It was based upon data for which a precedence had already been set. And if we are to accept Dr. Raup's proposition that the Census satisfies mainly the need for economic data, we may hypothesize that the economic dimension in level of living had something to do with its inclusion. I would not hazard a guess as to whether other standardized measures, or what type, could be acceptable to the Census. Certainly there are some questionnaire items and scales now available which reflect important aspects of human behavior which are not included in the Census.

Rather than limit the discussion to these, however, it may be more fruitful to discuss the question of variables of mutual concern which might help understand the causes and effects of the changes discussed by Dr. Raup.

The first change is the formal integration of agriculture into the entire process from the supplier of production needs to the marketing of the final product. The causal conditions promoting these contracts are not well understood. It may be that this change is merely a latter-day manifestation of the centralization of authority pervading our whole society. One research in Ohio shows that the farmer's willingness to sacrifice in-

dividualism for security explains part of the differential acceptance of contracts by farmers.

In any event, the nature and effects of integration are of more immediately practical concern. Several types of Census data could help us here. One is: who makes the decision regarding such things as the adoption of recommended farm practices. Is it in the contract or left to the farmer's discretion? It would further the research use of Census data, and possibly the ministerial and trade uses, if conditions of contracts were obtained and published. Presumably, the informal aspects of contractual arrangements would still require field studies. By informal aspects I refer to such variables as the extent to which the farmer knows the details of the contract, his conformity to these, and the means and extent of enforcement—that is, inspection and the like—by the contractor. However, a systematic record of the non-farm party with whom the contract is made (e.g. seed dealer, processor, etc.) would be feasible in census-taking. Likewise, new occupations are likely to arise as more farmers contract with a single supplier or processor, mainly the intermediary roles between the parties involved in the contract. The presence and characteristics of these roles could be obtained by the Census. Obviously such liaison positions would greatly affect farming. In the examples, as I understand them, the interests of the rural sociologist would, then, be greatly enhanced by Dr. Raup's distinction between the firm and the plant, the characteristics of each, and the relations between them.

The second trend discussed is that of absentee ownership. I concur with Dr. Raup in his discussion of the implication of this trend for data needs. It seems to me that the point of view of the rural sociologist could lead to exactly the same points.

Dr. Raup mentions the reservation many of us have concerning the agricultural significance of people other than full-time farmers who occupy farm land. He mentions the large percent of farmers' income which comes from non-farm sources and the significant portion of rural land whose use is under the control of other than full-time farmers. I would add another. These categories include a very large proportion of rural, and indeed, farm people. Insofar as our aims in the College of Agriculture include the welfare of farm people, the mere number of these people is a sufficient rationale for our attention.

As you know, rural sociologists have recently given much attention to rural non-farmers. Their presence influences farmers in groups, organizations, and communities. We would be greatly helped in building a body of knowledge about rural society if the rural non-farm category were more meaningfully defined. Of particular importance would be the

presentation of Census variables for non-farmers living in the open country, excluding village and unincorporated clusters of houses.

There is no more important problem in the definition of data needs than the definition of a discipline. The delineation of the data systems relevant to rural sociology as well as to agricultural economics is becoming increasingly difficult. The difficulty stems from the fundamental changes in the nature of agriculture mentioned by Dr. Raup. The two main principles of these trends are, first, that control of events on individual farms is increasingly alienated from the individual farmer, and, second, that a decreasing number of farmers have responsibility for an increasing population. The data systems needed to meet the challenge of new problems in social science brought about by the forces of alienation require a considerably different concept of agricultural data, as indicated by Dr. Raup. The increasing responsibility of farmers requires data on scientific agriculture. It is a happy circumstance that, as Dr. Jenkins indicates, the beginnings of this will be with us in the 1959 Census.

SUPPLEMENTAL DATA FROM THE FORTHCOMING CENSUSES

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Bureau of the Census

RESEARCHERS are aware that an enormous amount of information is collected by the Bureau of the Census about the people of the United States and their housing, about farms, factories, and businesses, and about other economic and social activities. They know, in varying degrees, how these facts serve the needs of government agencies, business concerns, and individuals. They themselves are almost certain to be consumers of Census data, either directly or indirectly. They probably are associated, or are working closely, with representatives of other groups who are using Census-collected facts to serve rural people. Any of these persons—whether engaged in activities connected with agriculture, industry, trade, banking, health, education, press or radio, social service, religious life, employment, civic affairs, etc.—could probably use more census data if the figures were available or could be obtained at little cost.

It is a duty of the Bureau of the Census to keep aware of the kinds of information needed by these varied interests, to gather the essential facts, and to publish the results for the use of all. Naturally there are limitations in carrying out such a broad assignment. The Director of the Census and his staff broaden their comprehension of the needs for data through Advisory Committees. These needs are translated into actual collection and publication of data after a review by the Congress and a grant of funds.

It is evident that not all useful information can be collected in the principal Census enumerations. Neither is it feasible to make all tabulations of collected data in which an interest has been expressed. If the full capacity of the tabulating equipment is utilized, it is logical to conclude that there will always be data on some of the tabulation runs or magnetic tapes which will not appear in any of the Bureau's reports. For discussion purposes, needed information will be placed in one of four categories, viz:

- (a) Data not collected or not collected in the detail required;
- (b) Data collected and published;
- (c) Data collected and not published but on punch cards, magnetic tapes, or tabulation runs;
- (d) Data collected, but not published and not on tabulation runs.

The first of these categories can be dismissed only after assurance that

no direct or closely related data were collected in any of the various Censuses. A glance at the questionnaires, usually reproduced in the respective volumes, will indicate whether any information was enumerated for a particular subject. If no direct data are found there is a type of researcher—the one who is able to make at least a limited survey on his own resources—who should not overlook the possibility of using other Census-collected data to design his survey or to appraise his results. Under certain limitations, the Bureau can assist in conducting a cooperative survey. This is possible when there is a public interest in the survey results. Projects carried on for nongovernmental groups must meet tests similar to those that are applied in carrying out a survey with public funds. Any survey must, of course, receive the approval of the Bureau of the Budget.

Suppose more information is desired about a subject, such as migratory workers. If any useful additional data can be obtained, from farm operators, such as the nationality of the workers, the season and period of their employment, crops for which the labor was employed, the wages paid and the perquisites furnished, etc., perhaps Census questionnaires would be a logical starting point for a cooperative survey. The supplemental study could be restricted to those farms which reported a labor expenditure above a given amount, provided the number of permanent hired workers in a farm's labor force was numerically insufficient to account for the dollars expended.

The data that will be supplementary in the forthcoming censuses can be placed in better perspective by referring to the past. By so doing, an opportunity is given to mention the guideposts to published and unpublished data. After that, we can turn to the new material.

It is a difficult task to keep abreast of, or to have knowledge of, all of the data which are published for a given Census. Normally, each of the volumes gives a presentation, in condensed form, of what each of the other volumes is expected to include. The presentation in the earliest publication is sometimes altered as new studies are added or because it is impossible to carry out in full a previous plan.

It is more of a task to acquaint one's self with the availability of data which are not in a published report. For example, a total for a given item may be located in the volumes either with or without an accompanying distribution by one or more of the various farm classifications, such as tenure, size, economic class, etc. If a desired classification cannot be found, perhaps such data may be stored on tabulation runs or on magnetic tapes. Usually data already on tabulation runs or on tapes can be had for relatively little money outlay. Therefore reproductions of these runs, or comments as to the content of data tapes, should be scanned thoroughly

for data not already published. If the punch card forms are reviewed, it may be ascertained that new data could be had if the cards were first arranged in a given sort. Or, perhaps the data on one punch card could be joined with those on another punch card to give associated information.

The most frequent calls for additional data, from the Census of Agriculture, come from users who desire figures for smaller geographic areas than those for which publication has been made. The requests for township or other small-area data have been numerous. It is not only desirable but also necessary that all information on punch cards be tabulated initially for relatively small groups of farms. This procedure is rewarding in the checking for internal consistency. When counties are handled as work units, county data may be available even though only State totals appear in a publication. Detailed data for a township, city, or county, are very important for the person studying a specific area but have relatively little utility for a person doing research on other small areas or on more generalized problems or areas. To publish in full all Census data for every township, city, and county would require more volumes than funds have ever provided for.

Because of the limitations in the amount of data which can be published, the Bureau has reproduced not only its questionnaires and schedules to show what has been collected but also its punch-cards and tabulation forms to illustrate the kind of information that has been or can be classified, related, and tabulated. The tabulation outlines, contrasted with the published data, provide the framework within which additional information can be obtained at relatively small cost. In several recent censuses, keys to unpublished data have been prepared and distributed for the guidance of those who are interested in obtaining supplemental data. In respect to Agriculture Questionnaires, tabulation runs, and punch cards there is a time limit for their retention. In general, the Agriculture Questionnaires are retained until two subsequent censuses. Tabulation runs and punch cards are normally destroyed at an earlier date.

In the most recent issue of the Annual Catalog of United States Census Publications (1958) the Bureau's policy in making unpublished data available and in giving assistance in surveys is set forth, in part, as follows:

Detailed information in the files of the Bureau that has been tabulated but not published can be made available, upon request, for the cost of transcribing or reproducing the statistics. Estimates of the cost of such special work are furnished in response to specific requests addressed to the Bureau of the Census.

It is the policy of the Department of Commerce . . . to relieve the general public from bearing the costs of publication and services of special use and

benefit to private groups and individuals so benefited. It is also part of the program of the Bureau of the Census to furnish specialized service to other Government agencies at cost.

The Congress appropriates funds to the Bureau to carry out certain projects. Since funds are limited, the Bureau cannot prepare or publish all the useful tabulations of the information collected. Administrative decisions must be made with regard to what information will serve the largest number of needs and how much of the information of general interest can be made available within the limits of available funds. The use of the filled-in questionnaires and schedules is restricted by law to employees of the Bureau of the Census. The use of specific sets of punch cards is restricted in accordance with the information shown on the card.

The work sheets and tabulation sheets, which show more detail than is found in published reports, can be made available through some method of duplication, such as photocopying or transcription. Basic source materials, such as schedules or punched cards, contain data that can be tabulated and used to furnish additional needed information. Arrangements can be made in some instances, to furnish information in advance of publication. Such arrangements entail additional cost, which has to be recovered.

Furthermore, there are available in the Bureau a variety of skills, equipment, and records which are maintained for meeting the regular commitments of the Bureau. These facilities can serve the needs of other Government agencies and other groups. The skills, equipment, and other resources can be made available for statistical operations such as survey design, mailing, field collection, machine tabulation, population estimates and forecasts, and similar tasks. To some extent members of the staff can be made available for consultation and planning.

Services as indicated above are furnished at cost by the Bureau. . . . Cost is interpreted to mean the actual cost to the Bureau of the Census, including the cost of planning the special work, plus appropriate overhead charges.

In the past several censuses, although every farm was visited, some of the inquiries were asked only for about one farm in five and for all large farms. Several inquiries which appear in the sample portion of the 1959 Questionnaire were asked at every farm in 1954. In a few instances, the reverse situation will prevail. In 1959, every farmer will be asked about ownership and rental of land; the manner in which the land he operates was used in 1959; the acreage, production, and sales of crops; acres irrigated; in the West, acreage irrigated by sprinklers, acreage of each crop wholly or partly irrigated and source of irrigation water; inventories of and/or sales of poultry and poultry products; inventories of various classes of livestock; production of wool and mohair; litters of pigs farrowed; operator's race, age, farm residence, and off-farm income; and off-farm work performed by him and by his family. The additional inquiries to be collected this fall, at approximately 140,000 farms of 1,000 or more acres and at one-fifth of all other farms, will deal with quantity and dollar sales of milk, cream, and live animals; acreage fertilized and

quantity of fertilizer used on principal crops; acreage limed and quantity of lime used; outlay for six groups of expenditure items; land-use practices such as cover crops, contouring, strip-cropping and terracing; labor employed during the previous week on the operator's farm and wage rates and hours of work for persons hired; specified equipment and facilities on the farm; rental agreement for making the subclassification of tenants; value of land and buildings; and presence or absence of a mortgage on the land owned.

In a broad sense, anything that supplies a want or an addition is supplemental, hence, even the new information in the census to be taken this fall may be considered for discussion. Other supplemental data will be obtained in subsequent surveys or enumerations, if present plans can be carried out. Let's begin with the idea that you are fairly familiar with Volumes I and II of the 1954 Census of Agriculture Reports. As a review, Volume I, largely composed of individual State Reports, carried county totals for every item that can be added or classified on the general Agriculture Questionnaire, except those relating to hours of work and wage rates for hired farm labor. A considerable portion of the various State Reports was given over to the presentation of State Economic Area totals for the characteristics of farms and farm operators by tenure of operator, by type of farm, and by economic class of farm. Volume II presented statistics by subjects for each of the various States and for the United States.

For 1959, there will be no presentation for State Economic Areas. Data for such a grouping of counties did not draw as much support as was anticipated. As a partial substitution, the County tables will include numerous frequency distributions for the major farm enterprises and also totals for major items for commercial farms separately from totals for all farms.

As a further replacement for the State Economic Area data, it is planned to tabulate, but not to publish, all data from the 20 percent sample for about 216 agricultural areas. These agricultural areas are component parts of States. They will be grouped, in the office processing, to present State totals for selected classifications in both Volumes I and II. Later, if reserve funds permit, data for these State parts will be grouped into 100 agricultural subregions and then published. Some of these subregions will cross State lines.

The users of agricultural data who are willing to pay for information for administrative or geographic units smaller than a county will be accommodated, as in the past. Totals, except for items in the 20 percent sample, will be available for Census county divisions for 17 States and for either township and other similar areas, or for combinations thereof, for the remaining States. These should be available after December of

1960, but can be ordered beforehand. Once a statistical table, bearing small-area totals has been prepared and checked, the subsequent cost is restricted to making a copy. Special tabulations of other data, for larger geographic areas, can also be had after December 1960. Since only those farms in the 20 percent sample will be coded by economic class and by type, additional data for these classifications can be had only for the 216 agricultural areas or for larger units of area. Users who contemplate requesting data which are not in Census Reports may reduce their costs by early consultation and planning with the Division. Copies of the tabulating cards which will be used will be available this fall for their guidance.

The definition of a farm has been revised. It is planned, therefore, to compile and publish data on the number of, and on some of the more important characteristics for, places that will be excluded from the 1959 farm count that would have been counted as farms under the 1954 and 1950 definition. Places to be included in the tabulations as farms in 1959 will be restricted to 10 or more acres from which the sale of agricultural products amounted to \$50 or more and places of less than 10 acres from which the sales of agricultural products amounted to \$250 or more. (For the 1950 and 1954 Censuses, all places of 3 or more acres were included as farms if the value of the agricultural production, exclusive of farm garden products, amounted to \$150 or more and all places of less than 3 acres if the sale of agricultural products amounted to \$150 or more).

A revision has been made in the class intervals for several economic classes of farms and in the criteria for their determination. The top three gross-income groups will be \$10,000 to \$19,999, \$20,000 to \$39,999, and \$40,000 and over. These replace the 1950 and 1954 groups of \$10,000 to \$24,999 and \$25,000 and over. Possibly, at the regional level, data for farms having \$100,000 or more gross income will be published separately from those for farms with gross incomes of \$40,000 to \$99,999. Farms with gross incomes of \$50 to \$2,499 will be classed as commercial only if the operator is less than 65 years of age, and either he did not work off his farm as much as 100 days in 1959 or the family's off-farm income in 1959 was not in excess of that gained from the sale of products from the farm. Those farms with gross incomes of \$50 to \$2,499 which are not considered to be in the commercial total will be separated into two groups, breaking at 65 years of age for the farm operator. In one of these groups, will be the farms whose operators were under 65 years and for which either the operator worked off the farm 100 or more days or the off-farm income of the family exceeded the farm income. The second group will contain all farms whose operators were 65 years of age or older and had a gross farm income of \$50 to \$2,499. The only exception to this grouping will be farms which are classed as "institutional".

Slight revisions for the 1959 Census have also been made in the grouping of farms by size and by type. For size, based on total acres in a farm, a new group of 1,000 to 1,999 acres has been added and for type of farm two new groups—tobacco farms and livestock ranches—have been added. Two previous size groupings, viz. 10 to 29 acres and 30 to 49 acres, have been combined.

Satisfactory objective data to indicate the completeness of a Census of Agriculture are available for some items. In order to further evaluate the completeness of coverage of the 1959 Census of Agriculture and to measure reporting errors for a few important items a field survey will be conducted in 772 segments of about 5 farms each. Data will be published, as in 1954, to indicate any incompleteness or overage for the items covered in this survey.

The findings in the enumeration of this fall, when every farm will be visited, will be supplemented with additional facts to be gathered by mailed inquiries and by field enumeration, mostly in 1960. There will, of course, be independent Censuses of Irrigation and Drainage. In the present planning, there will be a detailed survey of horticulture in early 1960. Later in 1960, surveys will be made of irrigation in the humid States and of farm mortgage indebtedness. These will be based on, or keyed into, the main Census of Agriculture in 1959. Some tax data will be obtained in the farm mortgage survey. In the fall of 1960 there will be a comprehensive supplemental Sample Census of about 12,000 farms. It should be emphasized that all of these subsequent surveys are dependent upon adequacy of funds held in reserve for contingencies. In an enumeration like that contemplated for 1960 it is possible to delve more deeply into some subjects than in a general enumeration. Since national or regional totals for some items will satisfy the needs of the principal users, it seemed advisable to relegate certain subjects to this complementary phase designed to round out the 1959 Census of Agriculture.

In recent census years, a substantial and increasing proportion of the farm operators have been working off their farms for pay at other jobs or in businesses of their own. These and operators of other farms may have still other sources of nonfarm income. In the 1960 Sample Census, the amount and source of off-farm income of farm-operator families will be listed in possibly ten categories, ranging from wages and salaries and various types of investment income to contributions received for the support of the family.

The 1960 Sample Census will ascertain not only how many pieces of equipment of various sizes are on each farm but also, for some items, the number of acres on which such equipment was used during the year on the farmer's own acreage and on other places. The ownership of power machinery—wheel tractors and crawler tractors—will be ascertained. The

type of fuel used for each wheel-type tractor, other than garden, will be asked for. It is probable that a regionalized type of questionnaire will be used so that the listed items of equipment may be varied accordingly.

A series of questions in the 1960 Sample Census will relate to the construction of new farm buildings since January 1, 1956, if the cost was \$100 or more. The types of construction to be covered in the survey are dwellings, barns, milking parlors, poultry houses, hog houses, buildings for grain storage, machine sheds, paved barnyards, and silos. For each new construction, information will be obtained—when appropriate—on its size, materials used for exterior walls, materials for roof covering, materials for framing, whether the materials were cut to size or partly prefabricated before brought to the place, and finally whether the building has electricity and running water.

Another section of the 1960 Questionnaire deals with farmer contracts. This whole new area of inquiry is designed to answer how far vertical integration has gone in the production of commodities such as eggs, broilers, turkeys, feeder animals, fattening of animals, vegetables, seed potatoes, and other certified seeds. Sugar beets and milk are not to be on the questionnaire. These are known to be largely under some kind of marketing agreement. The nature of the contract covering pricing and grading is to be reported. The contribution of the dealer, processor, or cooperative is asked for, whether it be machinery for harvesting, animals or chicks, feed, credit, or field inspection.

Also included for the 1960 Sample Census is a group of inquiries dealing with indebtedness of the farm operator. The increase in the amount of capital required to operate a farm of economic size has made the answer to questions relating to farmers' debts of more than usual interest. A distinction will be made between indebtedness secured by a real estate mortgage and that which is not. The data obtained will cover purchase-money mortgages, all indebtedness incurred for current production or operation, taxes due and unpaid, and a few other general-purpose items. No effort will be made to cover debts outstanding for farm family living expenses such as groceries, household appliances, etc. The plans do not provide for collection of data on the indebtedness of farm landlords or on capital supplied by feed dealers or food processors for commodities produced under contract with farmers.

Many data gathered in the 1960 Censuses of Population and Housing will be separately totaled and presented for people and housing on rural farms. The farm part of the classification will be made on the basis of the new definition of a farm, applied at every fourth household. This plan will provide County totals. The totals for farm people and farm housing will not include anyone or anything that is in an urban place. Of course, all families living on rural farms should be in the count of the farm popu-

lation provided they participate in the operation or the management. It is thought that the data collected in the 1960 Censuses of Population and Housing, although the reference date will be some 4 to 6 months later, can be reasonably associated with those obtained in the 1959 Census of Agriculture. The data tapes for the Censuses of Population and Housing will likely contain some statistics for rural areas which will not appear in the regular volumes. Among these will be facts for households on places of 10 acres or more which had less than \$50 sales of agricultural products and for households on places of less than 10 acres which had less than \$250 sales of agricultural products. Because of the re-use value of magnetic tapes, such a data-carrying medium will probably not be saved as long as is customary with decks of punch cards.

It is too early to make more than a passing statement about a special study to match the results from a sample of the reports obtained in the Census of Agriculture with related reports obtained in the Censuses of Population and Housing. Such a study is in the plans. The matching task will be somewhat more complicated than that following 1950. Statistics will be provided for the country as a whole and probably also for three or four broad regions.

Thus, all in all, the 1959 Census of Agriculture and its counterparts and the 1960 Censuses of Population and Housing will provide a wide range of information about farms and farm people. If you are familiar with the general plan of publication you may find the data you need without much effort. If you cannot ascertain whether certain facts have been published, you can ascertain their availability by directing an inquiry to the appropriate subject-matter division, Bureau of the Census.

DISCUSSION: SUPPLEMENTAL DATA FROM THE FORTHCOMING CENSUSES

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Even the most casual consumer of data from the Bureau of the Census cannot help but be impressed by the magnitude of the task facing the Bureau in its responsibilities for the collection, organization, and publication of information regarding American agriculture. However, any consumer of these data whose concern is more than casual knows that using these data is fraught with frustrations, and it is the nature of some of these frustrations, their implications for research, and ultimately their implications for agricultural policy which I shall mention.

As one who in the not too distant past was in a position to observe—but not to influence significantly—the formulation of agricultural policy during

a crucial period, I could not avoid being impressed by how little we know regarding key aspects of our agricultural economy. Without adequate information there appears to be little hope of consciously achieving a sound policy other than accidentally. Yet, amidst a wealth of data we find important gaps.

It would appear that much of the problem hinges upon a determination as to which data are basic and which are supplemental data. Some of the data that have been categorized as supplemental by the Bureau of the Census, and therefore relegated to a 1960 sample census, would appear absolutely basic to an understanding of the recent structural changes in American agriculture. Among these items I would include measurements of the quantity and sources of nonfarm income, the extent of contract farming, and the indebtedness of farm operators. At this point it can only be hoped that funds will be available to carry out the present plans for this sample census.

However, a sample of 12,000 farms will be totally inadequate to answer some of the most significant questions regarding the structure of American agriculture. It will allow, at best, limited subclassifications by type of farm, economic class, and location. Yet, I think it might be argued that a more detailed knowledge of these crucial elements which have appeared recently or which have been changing rapidly is of vastly greater importance than are detailed data on many of the characteristics of farms which have been gathered and reported in the Census of Agriculture for decades.

But half a loaf is better than none! And none we will have in many important areas. Why is the indebtedness of landlords not significant? It is true we shall know a great deal more about agriculture's financial structure after the completion of the sample census in 1960 than we now know, but we shall know a great deal less than we need to know. I would guess that most researchers in agricultural economics would trade all of the detail regarding the materials used in new construction for these extra questions regarding financing.

One of the most difficult problems facing the Bureau of the Census in its work must certainly be the fashion in which it classifies and aggregates the data which it collects. One of the most disconcerting problems to a researcher is the problem of comparability from one census to another. Certainly the 1959 Census of Agriculture is no exception.

First, the definition of a farm has been changed again. The change in definition will not change who produces the farm products in the United States although it will certainly improve the statistical average income per farm at a time when income levels in agriculture will be the subject of widespread debate. It will not, however, make farmers feel any better and it will probably make research workers feel less well in that they will have to attempt to adjust all data from previous censuses for comparability.

Of particular concern is the change in class intervals in the economic class of farm. It is true that the open-end interval in the old Class I ought to have been subdivided. But, in so doing it would not appear necessary to split the old Class II farms into two groups making it virtually impossible to compare data for Class I and II farms from the 1950 and 1954 Census with comparable data from the 1959 Census. Since the criteria have been changed for the Class V and VI farms and the change in definition also will exclude some of them, it appears that the only comparability that will exist between the present census and the previous two will be in the Class III and IV farms.

What I am saying is that the typical research worker would strongly prefer comparability in criteria and class interval from census to census with ample publication of cross classification that will allow him to make his own decisions as to which groups he includes in a particular analysis. Changes in criteria and in class intervals make impossible analyses of changes over time, and these analyses are an important portion of research.

Another disconcerting note regarding data from the forthcoming census relates to the decision to drop the tabulations by economic areas. It was reported that "data for such a grouping of counties did not draw as much support, as anticipated." It would be interesting to know what was considered as support, who was asked, and the weighting assigned to the various sources. It would seem a great deal to expect that widespread published use would have been made of these data when they have only been reported twice. I would expect, however, that if they were available again that important uses would be made of them. The economic area classification was not perfect, of course, but it was a major effort to group together data for areas subject to roughly the same economic forces. I found such groupings helpful in economic analysis, as did many of my colleagues, whereas I find little research use of many of the other groupings of data.

However, these decisions have already been made for the 1959 Census of Agriculture, presumably upon the basis of considerations of more importance than the interests of research workers. It is encouraging that the Bureau of the Census is willing to help research workers in their quest for supplemental data from the Census of Agriculture. It is not too early to begin planning for the 1964 Census of Agriculture. It is hoped that before the final decisions are made for that census the criteria for determining which data are basic and which are supplemental can be brought more nearly in line with the research workers' criteria. If so, we might derive a great deal more information relevant for those who must make public and private decisions in agriculture than we obtain from our present expenditures.

SOME NEEDED DEVELOPMENTS IN STATISTICAL PROGRAMS TO OBTAIN RESEARCH DATA

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THE idea of agricultural data for research is of rather recent origin. When we look at the systems which provide the bulk of agricultural data in the United States, we note that their beginnings go back far into our history and they produce general purpose data which serve many uses. The forces which brought agriculture into the United States Census and crop and livestock reporting into the U. S. Department of Agriculture go farther back in history than the Agricultural Experiment Stations, and three-quarters of a century beyond the more recent work in Agricultural Extension.

One of the impressive recent developments in American agriculture is the great growth of Agricultural Extension and the far-reaching new programs which have been undertaken. As these programs develop, the need for more basic knowledge supplied by research and agricultural data has been demonstrated, and we find it difficult to distinguish between the data requirements for research and those of Agricultural Extension.

Perhaps this is a proper place to point out that the early work of providing agricultural data by the U. S. Census was sought by leaders who were concerned with the size of our agricultural resources and their geographic distribution. The first Census of Agriculture was referred to as an "inventory of resources"¹ and not so much was said of other uses that might be made of such material once it was collected.

Soon, however, the pressure of supplies upon markets came to be felt, and unsatisfactory markets for farmers led to the early work in the Department of Agriculture. It was thought that more complete knowledge of production, supplies, and prospective supplies would help farm people in planning their output as well as in marketing. The concept of the use of agricultural data for research, however, did not develop widely until much later. Perhaps we can even say that it was not very sharply brought out until the decade of World War I and the subsequent formation of the Bureau of Agricultural Economics. Dr. Henry C. Taylor saw in the statistical work of the Department of Agriculture a means of implementing

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¹ Archbold Russell, *Principles of Statistical Inquiry as Illustrated in Proposals for Waging an Examination into the Resources of the United States with the Census to be taken in 1840*, New York, 1839.

the studies of economists, who, according to the concept of John R. Commons, might be called social engineers. The idea of providing data for the social engineers or economists who studied the problems of agriculture and tried to develop remedial programs was increasingly recognized.

The Main Data Systems in the United States

The early American economy was rooted in agriculture. The interest in this subject was widespread because most people were engaged in farming. Then, as cities grew and farming became more a matter of production for market, the volume of agricultural products grew rapidly. Competition between different areas became more important. Emerging problems in agriculture brought about a demand for information, and data systems were developed to describe the agricultural universe both in terms of magnitude and location and in terms of changes or trends.

The different systems which provide so much of our data can be classified as: (1) the objective data systems which produce relatively permanent data, such as that on land areas and that from other surveys built largely upon the land system; (2) the data systems which are mainly subjective. The latter include the work of the United States Census and the sampling work in the U. S. Department of Agriculture Division of Agricultural Estimates, as well as most surveys by others, such as Agricultural Experiment Stations, Agricultural Extension and others. The subjective systems differ from the objective in that they do not depend upon direct physical measurement or observation. They depend instead mainly on the knowledge of people, from whose minds the systems undertake by inquiry to get information which when summarized provides data currently descriptive of the agricultural universe and its parts.

Our systems have been a long time in developing, and many changes and improvements have been made to provide for newer needs. Changes are not always easy, and the direction and shape of new requirements must be clear before the working systems can be changed.

Let us look at the objective data systems which are basic to much that we know about our agricultural universe. As already noted, by objective systems we mean those which rest on physical measurements. These include the Land System, Soils Surveys, Climatic Measurements, Topographic Maps, Land Use Surveys, Air Photos and some others. All of these establish areas of land-water, soil type, slopes, climate, vegetative cover, etc. by physical measurement and direct observation. They are universally valuable in providing basic knowledge useful for purposes such as land zoning, site selection and others. They are long-lasting surveys which may be termed *nonrecurring* as compared with the subjective work which is *usually repeated at established intervals*. The great value here lies in the

fact that areas and other features in the universe, large or small, can be known precisely, and hence other surveys made subsequently can benefit from precision provided by basic descriptive systems.

In contrast with the objective systems, the subjective systems provide current economic data. Of these we will comment on: (1) the Census, (2) the Agricultural Estimating Service in the U. S. Department of Agriculture, and (3) the varied and numerous special surveys made by Agricultural Experiment Stations, the Extension Service and others.

A look at these complementary systems separately may help us to see where we can get some additional data needed as new work is undertaken.

Agriculture in the U. S. Census

It is not always appreciated that the provision in the Constitution² for a census was wholly for political reasons and that there is no evidence that the inclusion of data other than on population was foreseen by those who wrote the document. While the data on population were soon wanted in more detail, it was not until the Census of 1810 that questions on manufacturing were included. In 1840 agriculture was added. It was taken each decade until 1920, after which a quinquennial census of agriculture was added, thus reducing the interval to five years. The data of the censuses are taken by enumeration at relatively long intervals. New questions have been added as needs became clear; likewise, some old items have been discontinued when no longer needed; but much of the material is recurring from census to census. Up to now, agriculture has been enumerated along with population, but in 1960 the two will be six months apart, with agriculture taken in October and November 1959 and population in April 1960. This will make comparison between the two more difficult and our data would probably serve better if both could be taken in January.

Current data in the U.S.D.A.

In addition to long-interval, census type of needs, there is a history of demand for current data for shorter periods—that is, data by months, years, seasons, or other intervals. These, too, go back rather far into history, almost as far, in fact, as the demands for the longer-interval inventories made famous by the Census.

In the 1840 era, Commissioner H. L. Ellsworth of the U. S. Patent Office

² Article I reads as follows: "Representatives and direct taxes shall be apportioned among the several states which may be included within this Union according to their respective numbers, which shall be determined by adding to the whole number of free persons, including those bound to service . . . and excluding Indians not taxed, three-fifths of all other persons. The actual enumeration shall be made within three years after the first meeting of the Congress of the United States, and within every subsequent term of ten years, in such manner as they shall by law direct."

obtained a small appropriation from Congress. With these funds he undertook to make annual estimates of crop production by states and territories for a few years following the 1840 census. After Ellsworth left the Patent Office his successor modified these efforts, and later he suggested that the states should collect current data through assessors.

In the 1850's and earlier, agricultural societies also took an interest in current agricultural information.³ By an exchange of correspondence with members, and between societies in different states, attempts were made to collect information which was frequently related to current agricultural conditions and crop prospects.

Agricultural enumerations by state assessors, suggested earlier, were established in the 1850's by several states for the current collection of agricultural data. Indiana enacted such a law in 1852 and Wisconsin in 1857.

In 1862 an agricultural editor, Orange Judd, of the *American Agriculturist*, undertook the collection of seasonal agricultural data through the subscribers of his paper. He asked a series of questions to which subscribers returned answers and he in turn tabulated the material and published the results in following issues. This was a remarkable experiment in trying to provide short-time or seasonal information on crop prospects. Editor Judd found this a difficult job. He suggested at the end of the year that perhaps the task was too great for a farm paper and that such work should be undertaken by the government. The U.S. Department of Agriculture, organized in 1862, immediately undertook the task and its first crop report was issued in July, 1863.

The Department of Agriculture depends largely upon voluntary reports from farmers and others, and the Agricultural Estimates Division provides more than 500 agricultural reports per year, most of them under time deadlines. Much of the material is collected by mail monthly, but some is also obtained in other ways and at other intervals such as quarterly or annually. Since it has depended very largely upon voluntary respondents, the operation is conducted at low cost. Long and varied lists of items are covered regularly, and the budget for this purpose accomplishes much. Additions of funds here would go a long way in filling gaps and make possible some of the data refinements that are widely wanted.

Judgment of State Statisticians and Extension Directors

In order to get the judgment of others on issues to be examined in this paper, two surveys were made. A set of five questions was sent to

³ Even as far back as 1807, the officers of the Massachusetts agricultural society collected data from the members of the organization.

state agricultural statisticians⁴ and answers covering about thirty states were received. Likewise, a slightly different inquiry was sent to all Extension directors. From these surveys numerous suggestions and comments were obtained as well as experience regarding types of data requested, what it was possible to supply, and what has not been available, and also suggestions concerning additional needs.

Reports of state statisticians

When statisticians were asked what data are most useful for research or Extension, it was clear that the county breakdowns of state estimates were most important.⁵ Other data not widely available, but becoming more so, are data on varieties of crops grown, breeds of animals on farms, utilization of crops, movement of livestock, prices in more detail and with greater frequency than now offered, such as prices by grades and quality. Other items wanted are data on irrigation—that is, yield and acreage of crops in irrigated areas as compared with the non-irrigated areas.

One of the things done, wherever resources in states have permitted, has been to develop county data on some of the items which are regularly estimated by the U.S. Department of Agriculture. These county or micro data are the largest part of the data traffic on agriculture and the trend in this direction continues. In some cases, special tabulations of data from state assessors showing size groups have been helpful. In some states Agricultural Estimates offices have assisted in making local surveys by mailing and other assistance for research projects. If the needs are for large areas, surveys have been made by these offices where funds were available to cover the cost.

Regarding data that could not be supplied, a varied list was offered. Nearly all mentioned various county materials that are wanted, but which cannot be supplied. These include data on county farm income, frequently wanted by sources,⁶ and county detail on minor crops, which in many

⁴ Questions to Agricultural Statisticians:

- I. Within the last year or so what types of data have you been able to supply for research and for Extension programs?
- II. What data if any were wanted for research and Extension work which you could not supply?
- III. Have any agencies in your state conducted special surveys to supply data for research and Extension work? If so, please list as fully as you can the subject matter, data sources, methods used, and by whom the surveys were made.
- IV. If more funds were available for agricultural estimates, what data work to help research and Extension programming would you be likely to undertake?
- V. Any other suggestions for this paper.

⁵ See "Agricultural Data Requirements, National, State, and County" by the authors, *J. Farm Econ.*, 36:5, Dec. 1954, p. 1226.

⁶ A publication which provides estimates of farm income data for Indiana by counties and sources is Bull. No. 401, Purdue Agr. Exp. Sta., Department of Agr. Stat., Lafayette, Indiana (R. E. Straheim in charge).

states is not available because the resources are insufficient and the samples on which estimates are based are too thin. Other things desired but unavailable include such items as: data by townships; data for individual processing firms; data on fertilizer used, by crops; varieties of crops and breeds of livestock by counties; data on cultural practices; more information on part-time farmers; movement of feed and livestock; data on specialty crops; more detail on prices, especially prices by grades, and frequently for shorter intervals. Other items mentioned as being wanted by counties, but usually not available, include storage capacity on farms for crops, land values by classes of land, more data on farm labor and wages, details on land utilization, farm equipment inventories, and data on special industries such as flowers, nurseries, etc.

Information from extension directors

Thirty-one state Extension offices replied to a five-question inquiry.⁷ The replies show that new Extension programs⁸ create demand for new data and increase that for the old. Among the data items which have received great emphasis as a result of new Extension activities are: more and better small-area data, cost data for labor, transportation, input and output data to get production costs, changes in farms and farm organizations; data on people, their education and skills, family assets, home practices and equipment, off farm employment; data on marketing channels and firms, etc. Some of the data wanted were obtainable, others not. To some extent data from local and other sources were found to be helpful, but the survey approach has been used increasingly to fill gaps. Such sources as local planning boards, boards of health, college departments of agricultural economics, marketing, and rural sociology, and others have supplied some needs. Group survey methods have had some success; in fact there are various possibilities in this area. Often the Extension principle of "helping people help themselves" with their own problems can get survey jobs done. People who cooperate in data collection are also training themselves to carry out the programs that follow.

⁷ The questions to Extension directors were:

- I. In new Extension programs, what additional agricultural data have you found were needed?
- II. To what extent and in what ways have you been able to obtain the needed data?
- III. If you have conducted surveys to obtain data you needed, please list subject matter, sources, and methods of survey. If questionnaires were used, I would appreciate it if I could have sample copies.
- IV. Any comments you may have on additional data needs for present or future programs in Extension or for research would be gratefully appreciated.
- V. Any other suggestions for this paper.

⁸ The new Extension programs are: (1) Program Planning and Projection, (2) Farm and Home Development, (3) Rural Resource Development.

To provide special material, most states have had experience with surveys through various agencies and methods. It is often a question of cost as compared with the value of the data collected for a particular problem. The comments of Extension directors emphasize the need for closer ties between research and Extension.

Local surveys used more

When asked about surveys made in states by agencies other than the census or the U. S. Department of Agriculture, the statisticians reported that there were many and the number is increasing. They vary as to subjects and types. In connection with new programs, many are made by the Extension Service, usually in one county or, in some cases, a group of counties or some other special area.⁹ Such surveys are usually of a special character and for specific purposes. In some cases, for example, surveys are made to measure progress such as the adoption of new varieties of crops. Departments of Agricultural Economics make marketing, farm management, and other surveys. Also, Universities cooperate with the Agricultural Research Service of the U.S.D.A. in special studies. At times, local agencies cooperate in these surveys.

From all of this there appears a principle; namely, that the Census of Agriculture and the U. S. Department of Agriculture in their numerous and recurring, general-purpose surveys can cover many of the widely wanted, regularly needed items more quickly and more cheaply than others can. However, when it comes to the restricted area or commodity survey which is to be made only once or which covers the special items wanted in great detail, or to local surveys with involved relationships, the overall or global systems usually cannot undertake this type of effort. The need for such data often cannot be known far in advance and hence cannot be anticipated by a long-interval mechanism such as the Census even if they could otherwise be included. It remains for those using the data, such as agricultural research workers in departments like Agricultural Economics, Rural Sociology, Extension and others, to determine precisely what additional data are wanted for their projects or programs and then to establish studies by which they get what is needed in the form it is wanted and at the time required. This teaming up between agencies to obtain special data offers real promise. In this way problems can be approached in detail, locally, and specifically, instead of from the global approach of overall, general-service data agencies.

When agricultural statisticians were asked how they would strengthen their service if more funds were available, they suggested a range of

⁹ See *Michigan's Upper Peninsula Rural Resource Development Program*, July 1959.

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items. However, in the proposals, the word *county* appears often. What they are saying is, mainly, that if resources were available they would break down into more detail more of the material they already collect. In some states only the main items are now available in county breakdowns, and many of the livestock items and minor crops are so thinly sampled that it has not been feasible to undertake county breakdowns. Where this is the case, the men usually say that given additional resources they would enlarge the samples. Another item with high priority is the development of enough county detail on production and marketing so that county farm income estimates can be made by sources. Such income data are practically a summary of all of the production and price data for counties, and to do the job well would require breakdowns on all the items that enter into agricultural income. Along with this is the suggestion that data on costs and expenditures might be explored so that eventually some type of net income from agriculture might be provided for counties.

What Can We Expect From the Main Data Systems?

Further examination of the main data systems can help in suggesting things we may expect them to provide in the future.

First, let us look briefly at the objective data systems which are so basic to much that we know about our agricultural universe. They provide certain durable knowledge not subject to easy change. These include maps and some tables which can often be utilized for studies basic to zoning and resource development planning. Likely additional developments here are:

1. The gradual completion of unfinished physical surveys such as soils, topography, air photos, etc. for areas where these are incomplete or not available.
2. More use of what already exists in this area for appraising the physical land resources.¹⁰

Agriculture in the U. S. Census

Plans for the 1959 Census of Agriculture and the 1960 Census of Population are now nearly completed. It is probably too late to make major changes. Actually, the Census procedure and questionnaire content are under constant study by both inside and outside technicians and committees. Many suggestions are made, but few of them can be used. The overall, global, or national character of the work precludes adoption of much special material which is proposed. The more one works with the Census, the more one appreciates that this agency does an array of complex jobs

¹⁰ For comments on data use in rural zoning, see Wis. Agr. Exp. Sta. Bull. 479, pp. 10-11.

very well. The competence of the Census technical leaders and their capacity to get things done are widely recognized. Theirs are the hard decisions as to what can or cannot be undertaken.

We need to recognize that the collection of data on agriculture has become more costly and more difficult. At a meeting of the Census Advisory Committee for Agriculture last year, Mr. Hurley pointed out that it is much more difficult to take a census now than it was a few decades ago. Among the reasons for this, are:

1. Farms are larger, more complex and less easy to describe. Old boundaries between the urban and the rural have become confusing twilight zones.

2. Increasing numbers of farms now contain non-contiguous areas of land which may be varying distances apart and often in another township or county miles from the place of residence of the operator.

3. It is more difficult than formerly to employ men who know agriculture as enumerators. More of the enumerating is now done by women, many of whom are urban residents, who in spite of improved instruction and training may not be able to tell if the farmer's answers to questions are reasonable.

4. With income taxes and government programs and payments, some farm operators feel less free to give full information than formerly.

In view of all these problems, one would be reluctant to make questionnaires longer or load them with more detail.

We can make more use of what we have

Users of the Census material, however, can do much to make more use of what the Census already provides. We suggest the following:

1. Study the Census questionnaires on agriculture so as to be familiar with information collected and what regionalization of the questionnaires has done beginning in 1940, and what has been sampled beginning in 1945. Also determine what is published.

2. Ask the Census for needed information early and, if possible, consult with Census personnel regarding special needs.

3. Special tabulations can be had from Census cards and tapes and the Census should be urged to preserve such tapes and cards as long as there is demand for more information from them. This need is growing and in the future more use should be made of this service.

4. Recognize that the Census is an overall national mechanism and its work is expensive. We cannot expect the Census to collect special or local detail which while wanted in one place may not be needed elsewhere. The overall responsibilities of the Census do not permit this. But special surveys at cost can be made by the Census if there is public interest and the service can be paid for.

5. More can be done by subsampling from Census lists. Special sample surveys like the one planned for 1960, one year after the 1959 Census of Agriculture, which includes an inquiry on contract farming, offer possibilities for national and regional or macro trend data.¹¹

6. Every effort should be made to support the Census in its capacity to provide special summaries, small-area and other data, special tabulations, sorts, and photostats of unpublished summaries. Much can be had, but extra costs incurred must be covered by the recipient of the material. Even so, these costs are small compared with making surveys.

The Agricultural Estimating Service of the U.S.D.A.

Statistical work in the U. S. Department of Agriculture goes back to the very beginning of that Department. It is one of the career services in agriculture which will share fully in the centennial celebration of the U.S.D.A. in 1962. For over 42 years, the agency has cooperated with states, thus making possible more specific work to fit the states than an overall national agency could otherwise provide.

As with the Census, sampling by the U. S. Department of Agriculture has become more difficult as farms have increased in size and complexity. It seems less easy than formerly to get a good cross-section by the usual sampling methods. Costs have risen out of proportion to the resources available so that it has not been possible to enlarge the samples and do other work that might improve them.

Like the Census, this agency has overall national responsibilities. By continuous sampling it measures changes in a long list of items at short intervals and provides needed data between census years. Its capacity to report on so many repetitive items quickly and cheaply amazes visitors from other countries. This is made possible by the low cost and speed of the mailed sampling methods employed. The work is decentralized by states so that items of special interest in a state can be given more local attention. However, it must take mainly the overall approach and first meet its responsibility for national and state data. County data are usually breakdowns of state estimates and have too largely depended on additional resources from states. Likewise, to gather complex local or special data for specific projects has not been widely possible.

In commenting on this work the following points can be made:

1. Here again it is largely a matter of resources and how they can be used best. National funds have been supplemented by state funds in most states. The question of improving the accuracy of present work, as contrasted with expanding the number of items covered is a major one.

¹¹ "Better Basic Data for Agriculture and Some Possible Approaches," M. R. Benedict and G. M. Kuznets, *J. Farm Econ.* 40:2, p. 208.

2. In providing area detail, a major problem is the unequal development of the work by states. Where state funds equal or exceed federal funds much has been done in meeting local requirements. This has not been possible in states where only the federal resources and small state contributions are available. If all states could develop to the level already attained in the more advanced ones, the bulk of the needs reported by agricultural statisticians could be met. This is not likely to come from such unlike structures as the cooperating State Departments of Agriculture, so other means are needed if the less-developed states in this system are to be brought to the level of the more advanced ones.

3. The publication of statistical material for general use can hardly be considered finished until the data available are reproduced in some form for distribution to those who use them. The publication or output side is basic and there is enough experience at the national level and in some states to provide patterns. In many states, however, publication needs to be improved. Here is a major opportunity to synthesize what is available for wider use.

4. In addition to issuing publications, the Agricultural Estimates Offices in the states can serve as data repositories to which research workers, and others who need state data series, can turn. These Offices are a logical place to maintain up-to-date records of data that have been built up over the years at public expense. It is a matter of great importance that a user can turn to a central place for all of the production, price, and other data relating to a farm product, and for other items which may be of concern in a particular project. By paying the small price of photostatic copies, he should be able thus to obtain an up-to-date series on which all revisions and corrections are recorded. This is a basic service which many Agricultural Estimates Offices render now in varying degrees and it can perhaps be developed more fully. In planning projects, these Offices should be consulted early so that available data may be fully used and so that the Offices may know about surveys which may be proposed.

5. Another important service that Agricultural Estimates Offices can provide is a standardized set of farm price and farm income indexes for all major states. In some states this has been done for a long time, but more uniformly constructed series adapted for each major state would be useful.

6. For several years the Agricultural Estimates organization has had a program proposing to achieve four major objectives: improving national, state and county estimates; expanding agricultural price data; speedier distribution of reports; and the provision of some additional data and services. Much more can be done here but only if adequate resources become available.

Data collection through special surveys for Experiment Stations, Extension and others

Much data work for special areas has been done, including farm management studies, sociological surveys, marketing and storage surveys, commodity studies such as dairy and livestock and others, industry surveys, transportation and costs, agricultural practices, part-time farming, sources and use of information by farmers and others. These surveys needed for local projects can hardly be provided by overall, national, general-purpose data agencies. They are a part of specific research or other projects.

These special surveys have used various methods—mailed inquiries, enumeration, and others such as getting data through local organizations and agencies. In the Price County, Wisconsin, Rural Development Program, for example, an enumeration of population was made through a committee working with county and town officials in cooperation with homemakers clubs and the Rural Sociology Department. Not only did this enumeration get excellent coverage but it obtained data on the skills of the adult population to provide a basis for appeal to industries which might locate in the area if sufficient labor with known skills was available. Since this population survey was largely done with volunteer help, the cash cost was small.

With increasing activity of this kind for research projects and Extension programs, more and more surveys can be expected to be made jointly between Experiment Stations, Extension, the Agricultural Research Service and the Agricultural Estimates Division. Several Extension directors have pointed this out and suggested the desirability of developing adequate units in Universities to provide the needed leadership.

We must recognize that special data needs depend on the nature of the problem with which the researcher deals or the type of program that the Extension worker is developing. Each research project or Extension program probably has requirements somewhat peculiar to that particular project or program. We should first utilize fully the data that already exists, then undertake to provide the additional requirements. Sufficient funds should be included in research projects and in planning programs to conduct necessary additional studies. To implement almost any special project it is usually necessary to supplement existing material, and needs can hardly be foreseen in time to be specifically covered in anticipation.

Conclusion

In conclusion we can say that the overall global systems for providing agricultural data in the United States are doing excellent work. It is not easy to suggest major changes that can be made within the resources

available. However, the developing programs in the states can make much more use of the data which national agencies already produce. Everything possible needs to be done to make existing data available to users at a minimum cost. Users need to recognize that budgetary limitations are severe, and major improvements in systems can only be made if needs are clear and additional resources are provided.

Experiment Stations, Extension Services, and others are increasingly using special or local surveys to supplement the general service data available. Here there is room for improvement. In the first, place workers often have limited knowledge of what data are available and how they can be obtained, or what has been done in other places. Several Extension directors have suggested that there is need for developing more central units at the State Universities where skilled personnel and detailed knowledge of what is available are centralized and where experience in local and special surveys can be accumulated. Such units might also bring data users and data collectors more closely together, thus to an increasing degree coordinating anticipatory planning for data needs.

More generally, this will also mean that research and Extension personnel will need increasingly to acquire more knowledge of data sources and methods. At the national office of the Extension Service, and in many states, this type of leadership is already developed but in other states and in most county offices there is too little of it. As more local work is done, more skill both in bringing together needed data from existing sources and in making supplemental surveys at minimum cost will need to be diffused through the planners of programs and users of data.

There are no sweeping proposals to get all sorts of new data. There are no panaceas. Needs vary with uses, users, and purposes, and there isn't much agreement except that we want more data on more items, in more detail, and better. The suggestion that users clarify their wants and priorities is basic.

Data needs change. They are as changing as our dynamic economy. To a large degree government systems cannot anticipate most new needs, but they can follow as the needs crystallize clearly enough. If we know what we want precisely, and where and how it can be had, then perhaps if you convince the right people that it is worth the cost, ways to get it can be devised.¹²

¹² The authors are indebted to many for information and suggestions in the preparation of this paper. Thirty-one Extension directors and thirty agricultural statisticians replied to inquiries. In addition, specific suggestions were made by M. R. Benedict, R. K. Smith, E. C. Wilcox and others.

DISCUSSION: NEEDED DEVELOPMENTS IN STATISTICAL PROGRAMS TO OBTAIN RESEARCH DATA

ORLIN J. SCOVILLE

Agricultural Research Service

This paper is a worthy sequel to "Agricultural Data Requirements—National, State, and County" presented to the Association by the same authors in 1954. But in the present paper, Drs. Ebling and Ahlgren have been asked to focus upon desirable changes in statistical programs to better meet the needs of research. This is a timely subject. The growing interest in farm planning has stimulated the need for more and better data. Rapid data processing equipment has vastly multiplied the amount of data that can be analyzed. As a result, the demand of research workers for more data is continually increasing.

I would like to make two minor amendments to the statements in this paper. G. F. Warren should certainly be mentioned among the first farm economists to recognize the need for empirical data. His survey of farms in Tompkins County, New York, was made in 1908.

Also, I would like to have seen some attention given to the statistical activities of the Agricultural Economics Division and the Marketing Research Division, Agricultural Marketing Service; and of the Farm Economics Research Division of the Agricultural Research Service. These agencies have data gathering functions that are somewhat outside the categories of "global" and "local" employed in the paper. I mention this because the authors have established as a principle that the U. S. Department of Agriculture is at a disadvantage in connection with the one-time survey or the special items often wanted in great detail—or local surveys with involved relationships. I think USDA research agencies often need to make surveys of these kinds, either alone or in cooperation with State experiment stations.

Ebling and Ahlgren find it difficult to differentiate extension and research needs. I wonder how much differentiation need be made. Extension and research workers are both becoming skilled in use of the same techniques, and need similar kinds of data. Researchers use the data to test theories and develop principles; extension workers use the same facts to help farmers plan use of resources. Perhaps the greatest difference in needs of the two services is in the range of observation needed. Knowledge of phenomena over the complete range of observation may be needed to establish principles. Extension workers, on the other hand, may need large samples in order to deal with area variations that are of local importance. These differences suggest some of the compromises that need

to be made when surveys are made jointly by research and extension workers. The authors stress the need for close collaboration of research and extension workers in collecting information, and suggest more participation by local people in fact-gathering for studies with local application. Both of these suggestions are timely.

Considerable space in the paper is given to the listing of kinds of facts that are needed. However, I shall confine my comments to the topic of the paper—*needed developments in statistical programs to obtain research facts*. On this point, Ebling and Ahlgren find little room for improvement in the "global" activities of the Census and the Agricultural Estimates Division. But they see much room for improvement in "local" studies. For both types of activity, they are concerned almost exclusively with needs for additional data. Surely the need for quality improvement is equally important, not only for research, but also for public use.

One possibility raised for improving the services of the State-Federal statistical offices is to make mailing lists available for other studies. This is done in some States now. The usefulness of such lists for research sampling depends upon the degree to which the mailing list is representative of the universe. Samples can also be drawn from the Census through cooperative arrangements. The possibility of increased use of the Census, assessors' lists, and other enumerations as sources of samples should be explored further. For some surveys this would be the cheapest source of a sample. If pertinent data concerning the sample population such as size of farm, family characteristics, and land use can also be made available, valuable interviewing time can be saved.

With respect to global sources of data, the files and services of administrative agencies were not mentioned. Here is a source of research data in need of considerable improvement. Many Federal agencies, such as the Farmers Home Administration, the Commodity Stabilization Service, the Internal Revenue Service, the Social Security Administration, the Bureau of Reclamation, and the Bureau of Employment Security compile records of economic activities affecting their operations and the planning of their programs. These agencies should not be required or encouraged to gather data not directly needed in their programs. But much more of the data now reported by these agencies could be used by research agencies if more rigorous statistical standards were used in gathering and reporting the data. If public agencies are to maintain research and analysis services, it would seem that their sampling and analytical procedures should be required to measure up to the standards ordinarily required in research work, or at least that the statistical procedures used and the magnitude of error should be indicated.

Ebling and Ahlgren see vast opportunities for improving nonrecurring

and local surveys. Their recommendations are mainly concerned with greater cooperation among agencies and improved dissemination of results. Certainly with the expansion of economic research, increased coordination has become of great importance, but how shall we attain it? Could a general-purpose sample of representative farms in all major farming areas be devised and maintained that would replace some of the farm management surveys now being made? How far can we go in developing a common body of data that would be usable in the research on several problems or by research and extension jointly? Could sharper specification of research problems help to cut down the number of questions on which data must be gathered? I would like to have seen more attention to these questions in this paper.

GRADUATE STUDENT CONTRIBUTED PAPERS

Chairman: A. Gordon Ball, Iowa State University

RISK AND HYPOTHESIS TESTING

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IT IS a familiar notion that a hypothesizing-testing sequence is a fundamental element in any scientific approach to problem solution. It is usually presented as a cycle with the following steps: (1) statement of problems in terms of goals, (2) hypotheses in terms of means, (3) tests of hypotheses, (4) action on the basis of the tests, or reformulation of the hypotheses. References to this cycle are common in the literature of agricultural economics.¹ But is it enough to discuss methodology in our field in the terms of the usual presentation of this cycle? I believe there are elaborations and extensions utilizing the concept of risk that would be useful.

Most discussions of this cycle either overlook the problems of inference, or provide little insight to them. They imply that we can turn to the statistician and find a methodology of inference ready-made for our purpose. I will argue that readily available statistical devices are not complete with respect to inferential problems. There are problems of inference that are inherent in our conceptions; in the images of the world that we create, implicitly or explicitly. There is risk beyond that which statistics can evaluate for us. And part of risk that statistics can help us with, we must evaluate.

Theory, Facts, and Purpose—The Metaphysical Evolution

Metaphysics has been defined as "the discipline which concerns itself with the presuppositions underlying science."² Presuppositions are those things we take as given, explicitly, or that we take for granted, implicitly, in our thinking, or in our research. They may or may not be constants, but at least they are not the things we are trying to choose between at a given moment. Presuppositions are the substance of a philosophy of research; or a guide to thinking such as the hypothesizing-testing cycle.

* For many good points in this paper I am indebted to Howard E. Conklin.

¹ For example see Leonard A. Salter, Jr., *A Critical Review of Research in Land Economics*, University of Minnesota Press, 1948. See particularly Chapter III.

² A. N. Halter, "A Metaphysical Hypothesis," *Journal of Farm Economics*, December, 1958, p. 1871.

The metaphysical precursors of the hypothesizing-testing cycle have been: first, an emphasis on logical thought as a basis for science; second, the collection of facts as the true basis for science; third, the combination of these two extremes; and finally, the insertion of this combination into a framework of human purposes. Each of these stages has been given an "ism"—Rationalism and Empiricism as the extremes with regard to theory and facts, Criticism as their merger and finally, Relativism as the introduction of human purposes. Churchman calls the extension of Relativism, which we are going to discuss here, Experimentalism.³

What are the implications of the hypothesizing-testing cycle? To begin with, what do we mean by "problems in terms of goals"? Obviously we are assuming the existence of a purpose and some area of indecision about means for its attainment. The favorite purpose assumed or presupposed by economists is income maximization; and usually this means monetary or material income maximization. But money income can have a declining marginal value, and there are the familiar problems of evaluating non-cash income. Income maximization is an example of a presupposition that research workers have had to examine carefully.

Indecision about means leads us to the next portion of the cycle, "hypotheses in terms of means." Here the implication is that alternative approaches to accomplishment may have significant differences in their results. It is these differences that are the basis of our indecision. And the differences are measured in terms of units supplied by the original purpose.

"Testing" comes next. At this point in many introductions to this cycle the reader is given a discussion of experimentation. For the social sciences this may be a justification for judicious observations of fact as a testing instrument. But rarely is it made clear that we expect the image or theory of the problem to provide us with a probability framework to use in evaluating the consistency of our observations in terms of the differences between our alternatives. Variability in observations divides into two areas; first, the variability that still is consistent with the choice of a given alternative; second, the detection of variability that is inconsistent with the choice of a given alternative and implies the desirability of another alternative. "Testing" means finding and using some decision rule or procedure for final choice of alternatives which allows for variability. But the evaluation of a particular decision rule depends upon the errors of various magnitudes that can be made using it and the probability of these errors.

In "action or reformulation" we imply that the differences between our

³C. West Churchman, *Theory of Experimental Inference*, The Macmillan Company, 1948. Chapters XV and XVI are most relevant to this paper, which owes many of its ideas to that discussion.

alternatives, in terms of our goals, have been made somewhat clearer to us, i.e., the degree of indecision in terms of future choices has changed. Perhaps we are in possession of a secure decision. It is sometimes implied that this is the usual case; that we can now take one of our previous alternatives as given and go on in our next cycle to study problems within its context. This means finding sub-problems and working in more detail; sometimes terms such as sophistication, refinement, or precision are used to describe it. Actually research often leads to a need for reformulation.

"Reformulation" is often discussed as if it applied only to our set of alternatives. But major advances are made when we utilize "reformulation" to review our entire image of the problem, in some cases, back to our most basic presuppositions.⁴ Can we profitably use a risk concept in this? Choosing for review those parts of our image which might reduce risk seems intuitively appealing. How do we know we are secure in decision except by an evaluation of risk? Before we follow up in this discussion there are several ideas that should be introduced for the sake of completeness.

Other Additions Provided by the Experimentalist Point of View

A relativistic formulation of the hypothesizing-testing cycle can imply that there probably isn't such a thing as an absolute truth. Any problem must have its solutions tested against the purposes of man and since purposes change, truth changes. But it is very useful to assume that there is some sort of an absolute answer to a question which an infinite number of observations would allow us to reach. For any finite number of observations we hope to approach this ideal as a limit. This approach to a limit is not in the sense that the observations themselves will come successively closer and closer as we take more of them. But rather we think of an increasing probability that a cumulation of the observations approaches some limit. Any divergence of an individual observation from the limit will be specified by some probability rule or function. The stochastic limit which observations approach as they are cumulated, in the central limit theorem sense, is familiar to any who have read in the theory of statistics.

The concept of a stochastic limit enhances the explicit handling of variability in our problem image or theory. Such an image is in terms of controlling our observations so that we can make more efficient selections of our alternatives. For example, observations may be expected to vary along a production function, due to causes not specified in the functional relationship. But a specific theory with respect to the functional relationship goes a long way toward specifying consistent and inconsistent variability.

⁴ See James B. Conant, *Modern Science and Modern Man*, Doubleday & Company, 1955, p. 46. et seq., for his discussion of "hypotheses on a grand scale."

An ideal answer which can be approached stochastically provides a basis for the review of our image or theory as a result of observation.

If we allow an ideal to exist in any given problem—it is only a step along the same path to say that science has a purpose that is independent of other purposes of man, namely the absolute reduction of error. While science may be interested in reducing error in a particular case to the point where the magnitude of error no longer makes a difference to the purposes of the case, it is also interested in formulating the image of the problem and carrying out the remainder of the cycle in such a way as to reduce error absolutely. This has been shown to be highly useful. First, there will be some who, in acting as scientists, will provide the fund of "pure science" that makes "applied" science so much more productive. Reducing error beyond the needs of today's immediate purposes provides for the possibility that a lower level of error may be needed for tomorrow's purposes. Second, it makes explicit the place of science on one end of the continuum of man's efforts to find guides to action. In this continuum we find the farmer with his empiricist observation, "I do it because it works." Then there is the radio manufacturer whose products are the result of relatively little that is empirical, but, rather, the result of many highly developed and tested images that have led to secure decision procedures and thus have led to few imperfect radios. Going further along the scale, we come to science, whose purpose is beyond immediate goals; a purpose of absolute error reduction through a quest for the theories, the images, that explain nature fully.⁵

Criterion for Efficiency—Risk

Error *by itself* has no independent meaning except to those whose purpose it is to reduce it as such. In regard to other purposes, error must be evaluated in terms of its significance to those other purposes. The consequences of error we call loss. Loss in this sense can be positive or negative, i.e., giving up something now possessed, or actually gaining something. Also, the result of any alternative can be measured against the ideal and the difference thought of as opportunity loss in an opportunity cost sense.

Recall that in connection with "testing" we expected the theory of the problem to provide us with a probability framework to interpret variability in our observations. Some variability is consistent within an alternative. We can reject an alternative that is best in terms of accomplishing our purpose—the familiar Type I error of statistics. Within standard statistical formulas we can attach a probability to a given magnitude of error, and then translate this error into its effect on the accomplishment of our pur-

⁵ See Conant, *op. cit.*, pp. 35-54 for a similar approach to the place of science.

pose, i.e., we weight each loss by its probability and the sum is what we call risk.⁶

In "testing" we pointed out that we can expect variability that is inconsistent with a given alternative and implies that another is preferable. We expect a guide to the rejection of alternatives from our image. Thus we have the familiar Type II error of statistics—acceptance of a given alternative when it is in fact not consistent with the long-run stochastic limit of the cumulation of our observations. In providing a probability framework, our theory should allow us to again find a value for our risk, in this case for specific alternatives. Again the readily available techniques of statistics can help in the evaluation of risk in many instances. For risk associated with error in testing I shall use the term statistical risk.

But there is risk outside the range of statistical methods. It is associated with the errors that result from imperfections in our image, and the alternatives possible under it, in their ability to guide action. We might call this image error. It takes on probability characteristics in a different sense than in the previous types of error. Such an error and the loss it produces will be present with every alternative we formulate within a given theory. Probability of a given loss value is the same as the probability of choosing the alternative that will produce it. The best alternative will now produce a loss, and at least this amount of loss will occur with probability equal to one. But in applications of any finding of research, decisions are made over a range of situations. Each one provides a chance for an error, and thus a loss of some magnitude. A sum of these losses weighted by the probability of their occurrence over the range of situations provides a risk-like value, which I shall call image risk.

In "testing" we can use statistical risk. Its use is familiar to most of us in deciding upon the number of observations it would be wise to include. We speak of it as reducing the variance of our estimates. Where it is less familiar is in the actual construction of statistical tests. For example, how often is the effect of overestimation weighed against the effect of underestimation? The two may have very different losses connected with them. Usual statistical techniques implicitly assume that losses will be proportional to the mean squared error of estimate, which ignores the sign of the error. This implies risk is proportional to the variance of our estimate. This is perhaps a useful approximation; it is certainly conservative, but can we be satisfied with it? Similar arbitrary risk implications exist in tests constructed in accordance with the Neyman-Pearson Lemma, or what are called likelihood ratio tests which arbitrarily introduce an asymmetry in favor of a particular alternative—the null hypothesis. The specific effect

⁶ See *Appendix* for the step by step development of the risk function in the notation of the general decision problem.

on risk of this asymmetry depends upon the losses that are associated with the two types of error that statistics is able to recognize. Again we might ask if we should be satisfied with this situation. But we can't know if we are satisfied unless we have a knowledge of our loss functions and are ready to explicitly consider risk.

Explicit consideration of risk seems hard to avoid in the "action or reformulation" step of the hypothesizing-testing cycle. We have spoken of security in decision and by this we have meant that a given decision procedure has been found to guide action with an amount of risk that is acceptable in terms of our purposes. In other words, further improvement in selection between alternatives, or in our alternatives themselves, does not appear warranted in terms of the long-run gains. Our effort is better put elsewhere. On the other hand, we may not have arrived at a secure decision procedure. We wish to reformulate our problem and repeat the cycle. Should we revise our image? Perhaps our presuppositions should be tested? Our problem may be a simple question of having assumed too low a variance, and we need more observations. Or it may be more basic. Our most likely sources of risk would be a good place to start.

An Example from Farm Management Research

The argument might be best advanced through an example. First we shall build a picture of the farm management specialist as a researcher and extension man and note points where risk enters into his work. Then we will sketchily review three hypothetical images of his research efforts to see where risk can be reduced. In each image, differences in statistical risk will be present; but our main interest will be with image risk.

A basic problem in farm management is the combination of resources for maximum returns. This implies a knowledge of the resources available to the person making the combinations, and it implies a knowledge of the results of different combinations. The farm management specialist is trying to help farmers improve these combinations. He provides them with information about either resources or resource combinations. It will not apply as successfully to some farmers as it will to others. Different information will entail different amounts of risk. For example he might recommend that New York State farmers should not plant hops. Now some farmers would have better success with hops than others, but it is likely that all would be better off to follow this recommendation. Other recommendations that he might make will have higher risks. It will pay some farmers not to follow the lines of action suggested by the specialist's information. Risk is high because the specialist cannot consider every detail of every farmer's situation. He must generalize. We expect research to reduce this risk.

Our first image of farm management research might be called the survey image. It assumes that some farmers have a very complete knowledge of their farms and some will be successful in combining their resources. Less successful farmers do not include in their thinking all that is relevant. The specialist cannot use or get complete knowledge of the resources at the command of each farmer, but he can find out successful combinations of resources generally available to the farmers in an area. He can identify significant areas where resources are similar and at least find the most important combination characteristics. An analysis of key combinations and relationships will provide less-successful farmers with the knowledge they need in improving their combinations.

Information to be supplied the farmers will consist of models of success. Whether these are whole farm organizations, partially described, or only extracted features of farm businesses, it will be sufficient to get a picture of some farms at a single point in time. The specialist can reproduce this picture, pointing out how success is associated with various features. Less-successful farmers will then copy these successful features.

Second, we have the budget image. This assumes that maximization of returns may not occur in the present range of farmers experiences. If it does we shall verify it. If not, we should be able to point out where it may be achieved. Thus we are forced to make synthetic combinations. We make no assumption about the sufficiency of a picture which reflects a single point in time. The formal experimenter must be relied upon more and more to indicate the results of practices farmers have not yet begun to adopt. Data from farmer experience will be used when relevant.

In both the survey image and the budget image, the role of the expert is the same; he provides information about resources and about combinations; he makes substantive recommendations. The budget image may more easily allow consideration of the step by step process of how a less-successful farmer achieves greater success. But the major difference hinges upon whether success is best studied within the range of experience or whether we must go outside experience. Risk evaluation within the survey image cannot consider the opportunity loss of combinations outside experience. Within the budget image there is an opportunity to evaluate the risks within a wider range of data, but this risk evaluation is still limited to analysis within the substantive recommendations made by the specialist. There is little in the image which allows evaluation of risk associated with how farmers will use the information supplied by the specialist. That is, risk evaluation is not carried to its logical end point—the results on the farm. In both of the first two images the farmer is either expected to copy a picture of success presented to him, or he is in some way expected to conform to his role as spelled out in traditional economic theory.

The decision-process image is the third one that we sketch.⁷ This image assigns the specialist a larger role. Here he becomes a teacher of decision techniques. Farmers are recognized as having information about their resources that the specialist cannot have. Also they need information about combinations they have not yet tried that allows them to fit these new combinations into their individual resource picture. Above all, however, is the idea that their decision process is a variable in their success. At least as critical as the fund of information at their disposal is the process they use to fit it to their own specific conditions. Over their lifetimes they will be faced with changes, thus their approach to decisions will be used over and over again with a constantly changing body of data. The shortcomings of picturing a single point in time are recognized. The specialist is looked upon as a giver of recommendations where he can keep risk low, a developer and teacher of decision processes, and a developer and supplier of some information to be used in the processes.

With the first two images research emphasis is on the refinement of information to be provided to farmers. Field trials over a range of input levels and linear programming solutions for homogeneous areas are examples. Such refining has had as its objective a closer fit to the farm decision problem. Yet in some cases it seems to have refined itself right out of the problem. Research has made few checks on how farmers really decide on alternatives or even how farmers use the information supplied by specialists.⁸ Here is an area that would appear to offer considerable risk reduction potential in the interaction illustrated in the following questions. Can information be improved unless it is designed for the decision process in which it will be used? Can we better understand the farm decision process in order to improve information for it? Can we improve the decision process so it will better use improved information?

This example is suggestive but not complete. Between the three hypothetical images of farm management research it seems clear that there

⁷ We considered naming this image after the Farm and Home Planning Program now being carried out across the country. However, this might imply that we were entering the controversy over individualized vs. group extension methods, or that the Program universally incorporates this image. It is probable that much of the work in the Program is merely an extension of the survey and budget images; however, it does offer an illustration of the decision-process image in some of its features. This may be revealed in current studies comparing the Program's methods and success in several states.

⁸ The research problems of studying the decision process at the farm level compare with those of consumer studies in marketing in that it is difficult to distinguish rationalization from motivation. It is revealing in this connection to follow the North Central Farm Management Research Committee's Interstate Managerial Study. See articles by Jensen, Heady, et al., in *JFE*, December 1955, pp. 1097-1125, plus Glenn Johnson, "Methodology for Studying Decision Making," *JFE*, December 1958, pp. 1393-1404, and particularly the discussion by B. D. Crossman, pp. 1404-1406.

are definite differences in risk due to the characteristics of the images, and the alternatives they generate.

Summary

Through the concept of risk we have put the problem of inference in a form that is both general and useful. We have expanded the usual hypotheses-testing discussion and gone beyond it into the evaluation of pre-supposition, again, through the concept of risk. Where problems are in terms of goals and hypotheses in terms of means it is suggested that tests be in terms of risk and that action or reformulation also be in terms of risk.

Appendix—The Notation of Decision Theory

D is a set of possible decisions regarding alternative lines of action which are numbered 1, 2, 3, . . . , L .

To help us choose a decision we are going to take observations over the space of the random variable X . This results in m values of x . Both X and x may be an ordered collection of different observations, i.e., a vector.

The distribution of X is not known but there is some set of possible distributions indexed by θ , i.e., $f_1, f_2, \dots, f_\theta, \dots$ such that $f(x; \theta)$ is specified. That is, the probability of a given value of x would be known if we knew θ , which may again be a vector. If we knew θ we could go directly to a decision.

$s(x; D)$ is a decision rule which tells us what decision to take, perhaps with some probability other than 0 or 1, for any values of x . Thus for each decision 1 thru L , $s(x; D)$ will take on some value between 0 and 1 for each possible x value, where x may be a vector.

$w(\theta; D)$ is the loss function which specifies the penalty for making decision D when the true distribution is in fact θ . Negative losses would indicate that the penalty was in fact a reward.

$r(\theta; s)$ is the risk or expected value of loss, given distribution θ and decision rule s , i.e.,

$$r(\theta; s) = E_\theta w(\theta; D)$$

which in the discrete case would be,

$$r(\theta; s) = \sum_x \sum_D^L w(\theta; D) s(x; D) f(x; \theta)$$

This notation follows what will probably soon appear in an intermediate statistics text by L. Weiss of the Cornell Mathematics Department.

A non-mathematical review of almost all the significant results of this theory can be found in R. D. Luce and H. Raiffa, *Games and Decisions*,

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John Wiley and Sons, 1957. For a taste of this approach tailored to those who know little about statistics, or find it boring, see Irwin D. J. Bross, *Design for Decision*, the Macmillan Company, 1953.

DISCUSSION: RISK AND HYPOTHESIS TESTING

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Mr. Allee's paper is concerned with the problem of hypothesis testing or decision making in an uncertain environment. It is a subject that is both very interesting and very difficult: interesting because it deals with the heart of our economic science, the selection of alternatives to satisfy wants; and difficult because it involves familiarity with a number of disciplines—economics, statistics, philosophy, sociology, and psychology. It is small wonder that our achievements in this area to date have seemed rather meager.

A theoretical discussion of risk and the hypothesis testing cycle is given in the first part of the paper. The author distinguishes between two types of risk encountered in the decision-making or hypothesis testing cycle: 1) statistical risk—the probability of committing either the type I or the type II error when reasoning inductively from statistical data, and 2) image risk—the risk due to error in the model or theory, or in the postulates. He concludes the paper with an example from farm management research.

Statistical risk is encountered in the hypothesis testing phase of the cycle. It is correctly pointed out that traditional statistical tests serve only as a first approximation in decision making. They provide the probability of error without indicating the loss associated with error. "How often is the effect of overestimation weighed against the effect of underestimation?" Error in one direction could mean no loss; comparable error in another direction could mean bankruptcy. How often, too, is the loss due to type I error weighed against the loss due to type II error? For example, you may hypothesize that the barn will not burn down. The consequence (loss of barn) of accepting a false hypothesis—the barn will not burn—is considerably greater than the consequence (insurance premium) of rejecting a true one, the barn will burn. These weights are usually handled outside the statistical model and are often left to the decision of the individual farmer. We tend also to select the 5 percent or the 1 percent fiducial limit

¹ I am indebted to Walter Butcher and Alvin Egbert for constructive criticism. I also had the advantage of comments from Lee Day and Burt Sundquist.

almost by force of habit, when in many instances I am sure we would not demand this degree of accuracy to make decisions.

The question arises, "Can we develop 'consequence weighted' statistical tests?" The problem here is that the consequences of gains and losses are not the same for each individual. Hence, it seems very unlikely that we can create statistical tests of this nature that will carry a great deal of empirical significance.

Image error is associated with the model. First, because a model is usually a simplified image of reality, error arises because of failure to include *all* variables. This error is found in every model, and is, we hope, of minor importance. Secondly, error arises because of failure to include the relevant variables or because of improper specification of association between included variables. It is this latter and more fundamental error that rightfully concerns the author. As he states, we too often fail to re-examine critically our postulates or assumptions. Re-examination often leads to reformulation, sometimes of very basic precepts. Quantum mechanics and Keynesian economics are examples. Theories or images are usually developed through deductive and inductive reasoning which may or may not involve the use of statistics. The common procedure in the scientific method has been to reject a workable theory only when a more adequate theory can be found to take its place. A theory is judged "more adequate" on the basis of either predictive or explicative power. Therefore, predictive theory need not have empirical realism.

Proper evaluation of the image error and of the risk associated with this error implies a knowledge of the goals of individuals. To illustrate: as economists, we are often criticized for using the assumption of profit maximization. It seems certain that empirical investigation would lead to the conclusion that profit is in fact only one of many goals held by people. Further investigation would reveal that different individuals would attach different weights to profit as a goal. There exists, in fact, a separate objective function for each individual. However, we feel rather certain that profit carries a fairly important weight in most of these functions. Hence, we use profit maximization as an approximation of reality. The alternative to this procedure, providing the farmers the research tools and techniques and allowing them to carry through analysis using their own objective functions, is mentioned in the latter part of Allee's paper and will be discussed subsequently.

The author suggests that in the final stage of the hypothesis testing cycle we have two alternatives: 1) to accept the answer provided by the test and the consequences, or 2) to re-examine the testing procedure to reduce either image or statistical error. Again we are confronted with an empirical difficulty. For example, theory tells us that a particular produc-

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tion function has a certain form, Cobb-Douglas, quadratic, etc. We fit data using the function. Do the deviations from the fit arise from the statistical or the image error?

However, let us assume for the moment that we are able to isolate that part of error which we have called image error. In order to test the means for obtaining certain goals it is necessary that these means be accompanied by a function which describes the utility (or disutility) of gains and losses of varying magnitudes. We must know the value that the individual or group places on one alternative as opposed to another. We must be able also to handle the problem of means and conflicting goals. Again, it seems unlikely that we will be able to develop adequate test criteria that will assist us in reducing image risk.

In the example given by the author, attention is focused on reduction of error through reformulation of the image. Three approaches to farm management research are presented: (1) the survey image—which suggests that unsuccessful farmers achieve success through imitation (this is somewhat analogous to the “case study” method employed by the Harvard Business School), (2) the budget image—which frequently relies on synthetic formulations but provides a better step-by-step method for improving farm organization, and (3) the decision process image—which provides the farmer with the analytical tools and information that allow him to make improved or successful decisions.

The author states that this latter alternative seems to offer considerable risk reduction potential. Most of the teaching in farm management today is dedicated to this proposition. The objective of our teaching is to provide the student with the analytical techniques (e.g., budgeting) and principles (e.g., marginal cost) which will enable him as a farmer to make his own decisions when provided with adequate information. As the author points out, the Farm and Home Planning program of the Extension Service is also oriented in this direction. The two potential risks in this image lie in misuse of tools and lack of knowledge.

“Misuse of tools” leads directly to the problem of how farmers use techniques and make decisions. As is pointed out, despite recent efforts² we still know far too little in this area. Apparently, this is mainly because of the complexity of the problem, not because of any lack of interest or funds devoted to investigation in this area. However, problems of this nature point to the increasing need for cooperative research not only with the physical and biological scientists, but also with the other social scientists to whom we have given too little attention in recent years. I might add that

² See for example, last year's award winning paper by John Dillon, “Theoretical and Empirical Approaches to Program Selection Within the Feeder Cattle Enterprise.” *J. Farm Econ.* 40:5, December 1958, pp. 1921-1931.

the recent "management game"³ developed by IBM offers potential both as a teaching aid and in studying further decision-making patterns.

Despite the paucity of information as to how data are used and decisions made, it is still possible to improve the decision-making framework of farmers when lack of knowledge appears to be the major handicap. However, not all farmers will be capable of handling or will desire to handle the analytical tools necessary to make sound management decisions (i.e., logical decisions based upon their goals). The Extension Service is likely to have a continuing need for economic analysis that will assist them in making "recommendations". A large risk is involved in applying area recommendations to individual farmers. In this position the question is whether the survey image or the budget image will provide the lower risk.

In conclusion, this discussion is intended to be more of an elaboration than criticism of Allee's paper. His paper is primarily theoretical. To present a complete picture it is necessary to investigate the empirical implications of what the author has said. It is an interesting paper and a stimulating treatment of the selected subject.

³ The technical name is "Management Decision-Making Laboratory."

THE DETERMINATION OF AN OPTIMAL REPLACEMENT POLICY FOR A CONTINUALLY OPERATING EGG PRODUCTION ENTERPRISE*

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A PROBLEM of continuing interest in agricultural economics is that of determining the optimal policy for the replacement of producing animals in a continually operating enterprise. Of the several approaches to this problem we will consider a nonstochastic formulation. In this paper we will show how the problem may be approached by considering an equation that represents the recurrent replacement problem of a continually operating egg production enterprise.¹

Examples of processes fitting this recurrent replacement situation are furnished by an investigation of any type of livestock enterprise. In these enterprises we are faced with decisions concerning replacement policy in a biological system. The purpose of the decisions will be to maximize the profit from such enterprises. An example of a similar process from a physical system is the determination of a replacement policy for machinery in factories.²

The Replacement Decision Process

Before turning to a more specific discussion of the problem, we will present a brief description of the fundamental concepts involved. To begin with, a small amount of terminology needs to be introduced. At any time a replacement could be made, we will call this a *decision*. A sequence of decisions will be called a *policy*, and a policy which is most profitable will be called an *optimal policy*.

In studying an optimal replacement policy, we will examine the decision process which may roughly be described in the following way: We have a biological system whose state at any time t is determined by a set of physical and economic quantities or variables. At certain times, which

* The investigation reported in this paper is in connection with a project of the Kentucky Agricultural Experiment Station and is published with approval of the Director. The writer would like to acknowledge the advice of Dr. A. N. Halter, project leader, and Dr. George Morton (London School of Economics), consultant on method.

¹ Other approaches that have been suggested to determine the time at which to cull a layer are (1) the break-even analysis (E. P. Roy, "Floor vs. Cage System of Management," *Poultry Tribune*, September 1958; (2) the visual culling method, and (3) culling methods based on egg production records (Hans Abplanalp, W. E. Newlon, and Leon S. Rosenblatt, *Culling and Replacement Systems for Laying Cage Operations*, California Agricultural Experiment Station Bulletin No. 756, August 1956).

² See for example: Richard E. Bellman, *Dynamic Programming* (Princeton: Princeton University Press, 1957), p. 50.

may be prescribed in advance, or which may be determined by the process itself, we are called upon to make decisions which will affect the state of the system. These decisions are based on the prevailing state of the physical and economic variables and can be represented by a recursive equation. The outcome of preceding decisions is to be used to guide the choice of future decisions. The purpose of the whole process is to maximize some function of the variables.

Hen Replacement Process

Let us turn to the application of this method to the particular problem of a poultry enterprise in which an unprofitable hen is replaced by a more profitable one at the most advantageous time.

For any hen the total return is measured by:

Her present value, which includes her meat value and the value of her remaining egg laying potential

plus

The maximum of the returns that can be obtained by replacing the present hen with hens of any of N different ages.

The maximum return that can be obtained by the replacement hens of all ages is measured by:

The value of all eggs laid by the replacement hen during a production month

minus

The purchase price of the replacement hen, which includes her meat value and the value of her remaining egg laying potential

minus

The cost of the transaction

plus

The value of the optimum replacement policy in future enterprise periods.

The equation:

$$\Pi_{ir} = p_{ip} + \lambda \max_{j=1}^N \left[e_{jp} - p_{jp} - s_{ji} + \Pi_{j+1, r-1} \right] \quad \begin{array}{l} i = 1, \dots, M \\ p = r \pmod{12} \\ r = 1, \dots, R \end{array}$$

$$s_{ji} = \begin{cases} 0 & \text{when } i = j \\ k & \text{when } i \neq j \end{cases}$$

determines precisely the decision as to replacement that will maximize returns when the initial conditions (i.e., $\Pi_{j+1,0}$) are specified. This equation determines the age at which a hen of a given age will be replaced,

and with what age hen she will be replaced. At each time r , we have open one of two courses of action: (1) keep the hen for another time period, or (2) replace her with a hen of a different age.

Elaboration on the equation

To elaborate on the above equation arising from an application of the principle of optimality, let us begin with a description of the variables involved and a discussion of the assumptions underlying the relationships between the variables. We begin by defining Π_{ir} as the monetary return that can be obtained from a hen of age i in enterprise period r .³ This is the dependent variable for which the equation will be solved. The p_{ip} term represents the present value of a hen on hand of age i in production period p .⁴ This could be called the inventory or salvage value of a hen of age i , $i = 1, 2, \dots, M$. The expression to be maximized in production period p represents the maximum return of a replacement hen of age j , $j = 1, 2, \dots, N$. In other words, we can sell a hen of age i and replace her with a hen of age j that will maximize profits in a given production period. It will not be necessary to replace the hen of age i if the maximum return for its replacement is of the same age. In the equation, λ represents a discount factor which measures the relative value of a dollar now to a dollar one time-unit hence.

The expression:

$$\max_{j=1}^N [e_{jp} - p_{jp} - s_{ji} + \Pi_{j+1, r-1}]$$

represents the maximum profit that can be obtained from a replacement hen of any age j in production period p . The first variable, e_{jp} , is the value of the egg production of a replacement hen of age j in production period p .⁵ The second economic variable, p_{jp} , is the price of a replacement hen of age j in production period p . These prices are the same as the prices or

³ The reader should notice the difference between an enterprise period and a production period. A production period is the length of time over which the product is accumulated and is numbered in this case over the 12 months of a year; whereas, each enterprise period is of the same length as a production period but numbered over the life of the enterprise. Thus, the life of the enterprise will extend over many production periods.

⁴ In further consideration of the p_{ip} term, we assume that a hen of any age can immediately be sold.

⁵ An oversimplification of actual facts is represented by the assumption that hens will consume feed at a constant rate independent of their state of production. It is well known that with variability in egg production there is variability in feed consumption. We justify omitting the feed cost variable because it plays a minor role in decisions concerning replacement policy. However, it must be considered in the decision concerning the introduction or the termination of the enterprise.

values of hens on hand except that the p_{jp} represents prices at which we can purchase a hen of any age, whereas the p_{ip} represents prices at which we can sell a hen of any age. We assume that there is no time lag in obtaining a replacement, so that a hen of any age is immediately available. The third variable, s_{ji} , is the transaction cost of replacing a hen of age i with a hen of age j . This variable will include the commission charge of the trade, the cost of transportation of the hens to and from the market, and the cost of labor involved in replacement. Of course, s_{ji} will be equal to zero when the optimal policy is to replace a hen of age i with a hen of the same age j ; i.e., when $i = j$. If i is not equal to j , we can usually let s_{ji} equal a constant. The last variable, $\Pi_{j+1, r-1}$ is the maximum return of the decision process for a hen of age $j+1$ in enterprise period $r-1$. This quantity represents the value of the optimal policy that will be followed in the future enterprise periods. The $j+1$ value, instead of the j value is considered because in the next enterprise period (the $r-1$ period) we are dealing with a hen that is one month older.

Solving the Equation

At the planning stage of the enterprise, the information we seek is the age of hen to buy and her subsequent replacement through time. However, the solution is programmed by starting at the end of the enterprise. (This is an innovation of method that should have extensive applicability to poly-periodic production).

Given (1) egg production data by months for the life of hens of ages $j = 1, \dots, N$, (2) egg prices for every enterprise period $r = 1, \dots, R$, (3) purchasing and selling prices of hens of ages $j = 1, \dots, N$ and $i = 1, \dots, M$ in every enterprise period $r = 1, \dots, R$, (4) the transaction cost and (5) the discount factor, the equation is solved by successive iterations. We begin at the end of the enterprise with the last production month and proceed backward through time, solving the equation for the optimum replacement policy for each period based on the state of the system at the end of the enterprise. In other words, when we set r and ρ equal to one, we are dealing with the last production month of the enterprise. We proceed backward through time to the present production and enterprise period where r equals some preassigned value R .⁶

⁶ Thus:

End of Enterprise							Beginning of Enterprise	
ρ	1, ..., 12	1, ..., 12	1, ..., 12	...	1, ..., 12			
r	1, ..., 12	13, ..., 24	25, ..., 36, R			

where for ρ , 1 is December of any year, 2 is November, etc.

The initial condition or state of the system at the end of the enterprise is that we have a hen of some age on hand. Since the only policy open to us at the end of the enterprise is to sell the hen regardless of age, the selling price of this hen represents the maximum return of the replacement policy, i.e., the selling price is used initially as the value for $\Pi_{j+1,0}$ when deriving the replacement policy for enterprise period one.⁷

Once this value is specified we add to it the value of the eggs produced by the possible replacements of N different ages during production period one (e_{j1}), subtract the purchase price of the possible replacements of N different ages (p_{j1}), and subtract the transaction cost of the replacements (s_{ji}) providing, of course, $i \neq j$. We have then a vector of N possible returns from replacements of N different ages, from which we pick the maximum and add it to the present value of the hen on hand of age i in enterprise period one to obtain Π_{i1} . This Π_{i1} value is used for the $\Pi_{j+1,r-1}$ value in calculating the returns from the N possible replacements in enterprise period two; the maximum of these returns is added to the present value of the hen on hand of age i , resulting in Π_{i2} . The same type of iterative computation is made for each enterprise period, i.e., until $r = R$.

When the recursive equation has been applied over R enterprise periods, we have R values of Π_{ir} , one initial age i , and R replacement ages j . The R replacement ages j constitute a row vector of which the first element represents the age of hen to purchase at the beginning of the enterprise and the other elements, taken in order, represent the replacement age in each subsequent production (enterprise) period. The hen of age i at the beginning of the enterprise (initial planning stage) is of age $i + 1$ at the end of the first planning period ($R - 1$). Now, if $i + 1 = j$ in the second planning period ($R - 2$), then the hen is retained. If $i + 1 \neq j$, then the hen is replaced by one of age j .⁸

Having investigated the manner in which the equation is solved for the optimum replacement policy, it is obvious why we must begin with the last enterprise period and proceed backward through time to the beginning of the enterprise. Without the possibility of carrying out this procedure, we would have no way to evaluate the optimal replacement

⁷ Most caged layer operations will have in the cages at any one time a whole series of hens representing many populations. The operation may begin with hens all of one age, but because of death, excessive length of molting period, etc., some will be replaced at various times. Besides these first replacements, the replacements will themselves be replaced. The model presented in this paper is not realistic in its description due to its nonstochastic nature.

⁸ We assume, throughout the life of the enterprise, that a hen is replaced when she reaches the age of M months. It is convenient in all cases to assume that $N = M - 1$. In other words, when a hen is of age M we have but one course of action open, that is to sell her.

decision, i.e., we would have no means of giving a value to the $\Pi_{j+1,r-1}$ term which represents the value of the optimal policy in future planning periods.

A Specific Application

To demonstrate the applicability of the equation a 13 x 12 case was solved for an optimal replacement policy for ten years. It was based on data gathered by the University of California⁹ from 12 populations of pullets from a single source, hatched at successive monthly intervals, and maintained in a single plant under as nearly identical conditions as possible for periods of 17 months. Egg production data were gathered from the 12 populations from the age of 5 months through the age of 17 months.¹⁰ There were 100 hens in each population and the monthly egg production of each population was averaged. This average was multiplied by the corresponding monthly price per egg to give the values used for e_{jp} . Data on purchasing and selling prices of hens by months and by years were found in various sources of price data and were used as the values of the p_{jp} and p_{ip} terms respectively.

With these data on hand and the recursive equation programmed for the IBM 650 electronic computer the equation was solved for an optimal replacement policy. Table 1 shows the form of the resulting replacement policies generated by the equations. It should be mentioned that since we used 1952-53 egg production data from California and price data from Kentucky, the results should not be interpreted too literally. The table is presented merely to show the form in which the replacement policy appears.

We read the replacement policy as follows: We have on hand at the beginning of December, 1953, for example, hens of age 3 (7 months old) and at the end of December hens of age 4 (8 months old).¹¹ At the first of January (1954), we replace these hens with hens of age 3. At the first of February they are of age 4 and our policy says to replace with hens of age 4, so we keep these same hens for another month. At that time our

⁹ Hans Abplanalp, W. E. Newlon, and Leon S. Rosenblatt, *Culling and Replacement Systems for Laying Cage Operations*, California Agricultural Experiment Station Bulletin No. 756, August 1956.

¹⁰ The rate of lay is affected by the season during which a group of birds is reared. A further and possibly even more important source of variation is the age of the hens. In addition, there may be interaction among these primary effects in the sense that response to seasonal factors depends on the age at which hens are exposed to those factors. To the extent that these sources of variation are repetitive and are reflected in the variability of egg production between populations, they are reflected by e_{ij} , and hence in the optimum replacement policy as solved by the equation.

¹¹ If the enterprise were set up on January 1, 1954, the most profitable hen to acquire is of age 3.

TABLE 1. AN EXAMPLE OF REPLACEMENT POLICIES FOR CALIFORNIA CAGED LAYERS USING KENTUCKY EGG AND HEN PRICES^a

Month	Replacement policies given as values of j^b									
	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957 ^c
Jan.	3	3	3	3	3	3	3	3	3	2
Feb.	4	4	4	4	4	4	4	4	4	3
Mar.	2	2	2	2	2	2	2	2	2	2
Apr.	3	3	3	3	3	3	3	3	3	3
May	4	4	4	4	4	4	4	4	4	4
June	5	5	5	2, 5	2	5	5	5	2	2, 5
July	6	6	6	3	3	6	6	3	3	3
Aug.	7	7	2, 7	4	4	7	7	4	4	4
Sept.	2, 3 ^d	3	3, 2	5	5	2, 3	2	5	5	5
Oct.	2	2	2	2	2	2	2	2	2	2
Nov.	3	3	3	3	3	3	3	3	3	3
Dec.	3	3	3	3	3	3	4	3	4	3

^a Data sources: U. S. Department of Agriculture, Agricultural Marketing Service, *Agricultural Prices* (Washington: U. S. Government Printing Office, monthly, 1948-1958); Dana G. Card and James M. Koepper, *Prices of Products Bought and Sold by Kentucky Farmers*, Kentucky Agricultural Experiment Station Bulletin No. 601 (Lexington: University of Kentucky, June, 1953, annual, 1954-1958).

^b We defined the subscripts as follows: $i=1, 2, \dots, 13$; $j=1, 2, \dots, 12$; $\rho=r \pmod{12}$ and $r=1, 2, \dots, 120$; i and j were limited to 13 and 12 respectively because egg production data were limited to a twelve month period. When i or $j=1, 2, 3, \dots$, the actual ages of hens will be 5 months old, 6 months old, 7 months old, \dots , respectively. For convenience we set $\lambda=1.0$ and $s_{ji}=\$0.08$.

^c Initially, $p_{ip}=p_{ni}$.

^d The choice of replacement or of keeping the hen is a matter of indifference from the standpoint of net returns.

policy dictates replacement with age 2 hens, and so on through the remainder of the year.

We notice a repetition of the policies for several years, then some of the j values change, and finally the original policies are repeated again. This is due to the presence of price cycles in the data whose phases and amplitudes are not completely fixed and regular. If the phases were all of equal length and of the same amplitude, then it would be reasonable to expect that our replacement policy would stabilize and repeat itself year after year.

Limitations and Implications

We must keep in mind that this is a nonstochastic description of the process. We are dealing with averages and this presents certain well-known objections, which we will not consider in detail. However, we should note that the process by which the Π_{it} values can be estimated with the equation presented in this paper tends to conceal the stochastic nature of the process. If we consider a realistic situation, within the same population we would find great variability among hens' laying capacities. Among the biological variables which may affect output, those of sexual

maturity, rate of lay, mortality, and tendency to molt deserve attention. Each of these characteristics is assumed constant or nonexistent, and is not considered in the formulation of the equation. Certainly these are a few of the variables which must be accounted for in any stochastic model. In principle, there is no compelling reason for building our replacement equation in an exact, nonstochastic formulation. It would appear, however, that the estimation of the Π_{ir} values in a stochastic model would be extremely difficult. Regardless of the complexity, we need to develop a method that will determine the replacement policy under the stochastic case. We believe that this nonstochastic approach will be a beginning to the development of a probabilistic model with which an optimum replacement policy can be derived for a biological system.

As a practical matter, we need to consider the different uses that might be made of the equation from the standpoint of (1) the researcher, (2) the extension worker, and (3) the individual decision maker. Here, we are *not* implying that there are three separate and distinct methods of solving the equation. On the contrary, regardless of the form of the data, the equation generates the optimum policy by the method explained above. However, depending on the intended use, both the form of data and the implications of the replacement policy will differ.

The researcher may be concerned with the stability of the replacement policy, e.g., how changes in prices or in the price cycle might affect the results of the equation. In order to determine the stability of a policy, he may want to experiment with the equation by first using one set of data and then another, each with differing prices or price cycles. The researcher may also be interested in the aggregative effect of all poultry producers following a recommended policy.

The extension worker's interest is in providing general recommendations as to a hen replacement policy. His ability to perform this service is limited by the data requirements, e.g., by the accuracy of price forecasts, by the availability of experimental data, and the lack of knowledge concerning the future level of inflation (or deflation).

The equation probably has its greatest potential applicability to the cases of individual decision makers or to integrated producers. If the producers will supply their own expectations or estimates of future egg prices, future purchasing and selling prices of hens of different ages, the average rate of lay by age of hen, and the cost of replacing a hen of one age with a hen of a different age, the equation will generate the optimum replacement policy as it applies to their particular cases. Programming the equation for electronic computing equipment enhances the potential for individual decision making beyond the scope of these meager comments.

DISCUSSION: THE DETERMINATION OF AN OPTIMAL REPLACEMENT POLICY FOR A CONTINUALLY OPERATING EGG PRODUCTION ENTERPRISE

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Mr. White presents a very interesting approach in the determination of an optimal policy for the replacement of producing animals in a continually operating enterprise. Our interest, at this early stage of analytical development, should be mainly concerned with the methodological considerations in applying this particular or other alternative techniques that present possibilities in their application to a biological production system. Exploratory research of this nature has much merit, because in the process of applying new techniques, limitations are revealed, thus indicating potentially fruitful areas of research. If White's technique for profit maximization has merit, then these areas for new research should be investigated prior to fully evaluating its applicability to livestock enterprises.

White is cognizant of the limitation of the nonstochastic formulation of his replacement equation, and is aware of the need for additional basic research that will eventually yield a practical and workable model for determining an optimum replacement policy which can be derived for a biological production system. One of the most basic and urgent needs in successfully developing and testing the applicability of workable techniques is designing and conducting basic studies that would yield meaningful production coefficients. I agree that the economics researcher should be concerned with the effects of changing economic relationships on the stability of the replacement policy. Price mapping is one means of accomplishing this task.

Since White's model is exploratory and methodological in nature, his approach to the problem appears to be reasonable, *viz.*, the model is operational within the restrictive assumptions indicated in his paper. One could argue that the simple budgeting technique would have yielded similar results. However, if we go beyond White's model and consider a more realistic approach and the stochastic nature of this type of problem in determining a replacement policy, we have to agree that simple budgeting techniques are not adequate. In reviewing this paper, I considered fully that White's "nonstochastic approach . . . (is) . . . a beginning to the development of a probabilistic model with which an optimum replacement policy can be derived for a biological system."

The data in Table 1 indicate that there is always a replacement taking place in all years on October 1 and with age 2 hens (6-months old hens having good production performance). This is similar to the usual recom-

mentation to have hens start laying by September for winter production and take advantage of winter prices. Likewise, all hens will be replaced on March 1 with age 2 hens (6-month old hens). This will take care of spring production of eggs. If a generalized recommendation can be made from White's results, it would be that a farmer should hatch his eggs (or buy chicks) so they will be ready for production by September; these layers should be kept until March and then replaced by another batch of hens aged 2 (6-month old). These hens will pass their production peak in time to be replaced by a new group in September. There is no way to tell how profitable the spring and summer group is when most farmers need at least some facilities (hence, opportunity cost) to get ready for the fall operations. Thus, for a farmer the one batch per year program may still be the most profitable operation.

It would have been of interest if some idea of how replacement, say age 4 for age 3, would affect the total net income. A small sum of one or two cents may cause the hen to be replaced, when other factors may have greater influence than the mere fact that she has exhausted her egg laying ability. Also, since the October-March period never exceeds age 4, this indicates that prices are either continually rising or egg production is very stable. Other periods go as high as 7 which is the limit (1 year old hen). Egg prices normally hit their low about June and rise rapidly. This type of price relationship may compensate for the lower production after age 4, thus making it profitable to keep the hen until age 7.

We are in agreement that the most realistic approach to developing a replacement policy would be to utilize a stochastic model utilizing all relevant production data, without having to assume away any of the practical aspects of the model. The next few comments are concerned with some of the practical considerations in examining this type of problem.

Based on my research experience in this field and my rather limited knowledge of the biology of the egg production process, I would have to assume that the feed cost variable "plays a major role in decisions concerning replacement policy."¹ Feed is an important cost of egg production; hence, the commercial poultryman is primarily concerned with securing the greatest possible efficiency in the conversion of feed into eggs. The "assumption that hens will consume feed at a constant rate independent of their state of production" is not only an oversimplification but is far from reality, as indicated by White. Within lots of hens for any given time, the variability of the production coefficients among the hens is great, and this particular aspect of the enterprise must be accounted for in the model. The commercial poultryman is dealing with laying flocks consisting

¹ Cf., Samuel Brody, *Bioenergetics and Growth*, Reinhold Publishing Corp., 1945.

of large numbers. He relies heavily on experience and his own managerial ability in keeping the hens healthy and culling those birds who are inefficient egg producers. To a large extent, the commercial poultryman cannot escape setting a policy based on average performance. Because of this situation, more research should be devoted to the methodological procedures in the economic analysis of egg production data. If the economist and the poultry scientist would combine their research efforts, more useable and meaningful technical data will be generated, and make possible better economic analyses in this field.

It is evident that if White allowed some of the factors to vary, rather than holding them constant, a much different replacement policy would have resulted. Perhaps this exploratory research would have yielded greater returns if the method used could have been compared with one or more alternative approaches in order to obtain some measure of efficiency. From a methodological standpoint, it would be of interest for someone to apply Mr. White's approach to the determination of an optimal replacement policy for the dairy enterprise. There are good sources of input-output data for milk cows throughout the lactation period, by age and breed. It is more common for the dairyman to be more familiar with the production performance of each of the cows in his herd than is true for individual hens.

In closing, I should like to make the following remarks. Mr. White is to be commended for undertaking a pioneering research assignment. It is always difficult to develop new methodology for practical application. Then too, there is usually a paucity of good workable technical data. This forces the research worker to restrict development of the model to conform to his data. Well-planned research to yield suitable data, and the development of workable techniques, require huge sums of money, highly trained research staff, time, and tolerant understanding by administrators. The successful development of sound analytical techniques is a slow process and the above factors must be operating in a positive manner.

I reviewed Mr. White's paper with the full realization that his paper explored the application of a technique in its formative stage to a difficult and dynamic problem. It is always easy to emphasize the limitations of such research. I chose to raise some of the points mainly as a caution, but fully sympathizing with the problems confronted by Mr. White in conducting this research. Such research is valuable and necessary, because the resulting limitations clearly indicate important areas of needed research. Research progress is achieved in this manner. In this sense, Mr. White's presentation should be considered as a contribution to the storehouse of knowledge available to agricultural economists.

LOCATION THEORY AS APPLIED TO MILK PROCESSING PLANTS

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I. Introduction

THE dairy processing industry is in a period of transition from many small cream creameries to few large milk processing plants. A long-run planning program would help to guide the dairy processing industry through this transition period. For example, it would be extremely helpful to the management of dairy firms, both cooperative and private, to know how far apart to locate their future milk processing plants.

The contribution of this paper is its development of a model for integrating the relevant elements of location theory with firm theory as applied to milk processing plants and its evaluation of some of the applications of this model.

II. Location Theory and its Application

Location theory is a varied subject. Von Thünen developed the theory of agricultural production location. Another German economist, Alfred Weber, theorized a method for analyzing the location of processing plants. Von Thünen's theory is based on the competition of land uses on an industry level. On the other hand, Weber was concerned with the location problem of an individual firm producing a particular product.¹ The latter is the branch of location theory applicable to the location of milk processing plants.

Weber's theory of location of individual firms of an industry had the following assumptions:²

1. Equal transportation costs of all products.
2. Many consuming centers.
3. Equal costs of raw materials at all deposits.
4. Unequal distribution of raw materials.

The factory would be situated at the point of lowest cost, which was determined by considering weight reduction processes, weight increasing processes, freight rates, insurance, labor costs, and transfer costs.

Lösch also studied the problem of location of processing plants, but he viewed it from the standpoint of (1) the lowest total costs, including both transportation of the raw material and finished product and processing

¹ Dunn, Edgar S., Jr., *The Location of Agricultural Production*, page 87.

² Weber, Alfred, *Theory of the Location of Industries*, p. xxiii.

costs, and (2) the greatest profit to the firm.³ Only in perfect competition would the location for greatest profit coincide with the location of lowest cost. Lösch applied his theories to many situations, especially in North America.

One of Lösch's applications, with modifications, can be applied to the problem of location of milk processing plants. In one of his examples he used an evenly distributed population, and his problem was to determine how far apart breweries should be located to meet the demands of this evenly distributed population.⁴ His second assumption was that the economic raw materials were evenly and adequately distributed over a wide plain. A more tenable assumption in the problem of location of milk processing plants is that it is the supply, rather than the demand, which is evenly distributed.

III. An Analysis of Location of Milk Processing Plants

A. Type and organization of information required

Von Thünen's location theory when applied to the dairy industry indicates that milk produced far from the centers of population, as is the case for Minnesota and Wisconsin, will be manufactured into products of considerably less weight: cream, cheese, butter, powder, and condensed and evaporated milk. Location theory of Weber shows that, since the raw material (milk) loses a considerable amount of weight (so that the cost of transporting the raw material, whole milk, is greater than the finished product, butter and powder), the processing plant would be located at the source of the raw material. In the following analysis the volume of milk production will be assumed as given, and moreover, it will be assumed that it will be processed into cheese, butter and powder, or some other condensed form of fluid milk.

Let us suppose that all of the dairy farmers in Minnesota form one cooperative to process their milk. Their problems then become: what size of plants to have and how far apart these plants should be.

The following assumptions are used in studying this problem:

1. Milk is produced evenly over an area and at a given rate.
2. Transportation costs per cwt. of milk are uniform throughout the area.
3. There is perfect competition on the selling side of the market for the manufactured product: butter, powder, and cheese.
4. The same price exists for butter, powder, and cheese at all locations (zero transportation cost of finished product).
5. The type of business is a cooperative.

³ Lösch, *The Economics of Location*, p. 27.

⁴ *Ibid.*, p. 105 and 109.

Since the total milk production is given, the relative location of one plant to another determines the volume in each plant. Also, since this business is a cooperative with no profits, we look for the special case where total costs (including assembling and processing) are the lowest. We now need to determine what our total costs are. We will first look at assembly costs and then at processing costs.

1. *Assembly costs.* Let us first consider the marginal cost of assembling milk. For our purposes let us divide the cost of assembly into two parts. The first part would be all costs involved while the truck is being loaded. This includes the cost of picking up the milk from each patron and traveling from the first patron to the last patron. These costs would vary with the sales per patron and the distance between patrons, but would not vary with the distance of these patrons from the plant.

The second part of these costs includes the cost of going to the first patron and coming back from the last patron. For the processing plant the *first* part of the procurement costs is fixed and *does not* vary with the volume of milk in a plant. Therefore, the marginal costs of milk assembly are only the cost of the second part.

These marginal costs are about 0.984¢ per cwt.-mile of milk.⁵ Then the marginal cost of assembling milk is this factor c times the distance from the plant r or cr (figure 1).

The marginal costs of assembling milk on a volume basis can be determined because volume is related to the distance from the plant r . The volume is equal to the density of milk per square mile D times πr^2 : i.e., $V = D\pi r^2$. Hence $r = \sqrt{V/\pi D}$ and the marginal costs of milk assembly are $cr = c\sqrt{V/\pi D}$ (figure 2).⁶

The total variable cost of assembly is the integral

$$(1) \quad \int cV^{1/2}(\pi D)^{-1/2}dv = \frac{2}{3} c(\pi D)^{-1/2}V^{3/2}$$

2. *Processing costs.* We are considering how far apart plants should be located which means that we are allowing plant size to vary and that all processing costs are variable costs. In this analysis the long-run planning curve or Chamberlin's "envelope" curve is used. This long-run planning curve can be determined from the processing cost curves of several different

⁵ *News for Farmer Coops*, 19 (8); Nov. 1952, pp. 8-9. A straight can van truck with an average gross weight of 11,494 pounds had a hauling cost of 3.7¢ per ton-mile or 0.185¢ per cwt.-mile of gross weight. But this truck may haul only about 72 cans filled with 60 pounds of milk each, or 4,320 pounds of milk, one way or an average of 2,160 pounds each way. Then this 0.185¢ per cwt.-mile of gross weight becomes 0.984¢ per cwt.-mile of milk.

⁶ R. G. Bressler also notes that density is a factor in determining the optimum size of plant. "Pricing Raw Product in Complex Milk Markets," *Agricultural Economics Research*, Vol. X, No. 4, October 1958, p. 118.

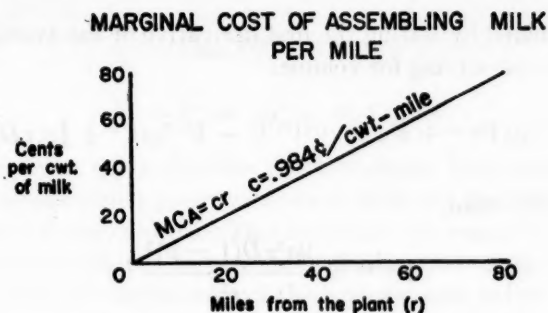


FIGURE 1. MARGINAL COST OF ASSEMBLING MILK PER MILE

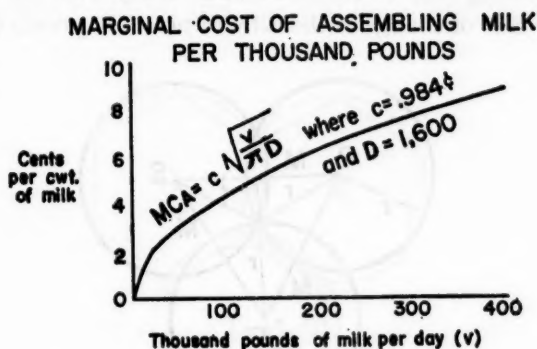


FIGURE 2. MARGINAL COST OF ASSEMBLING MILK PER THOUSAND POUNDS

sized model or proposed plants at a specified level of capacity.⁷ The total processing cost curve associated with this long-run planning curve could be of the form aV^b where

a = the ratio of costs to volume

b = the rate of change in this ratio of costs to volume

V = volume

Then the total costs for this firm to consider are the total variable costs of assembling milk plus the total processing costs associated with the long-run planning curve, or $aV^b + \frac{2}{3}c(\pi D)^{-1/2}V^{3/2}$. Average costs are equal to

$$(2) \quad AC = \frac{aV^b + \frac{2}{3}c(\pi D)^{-1/2}V^{3/2}}{V}$$

Special case of lowest average costs. Since we are working with a cooperative with no profits we consider the special case of lowest average cost. This

⁷ Arvid C. Knudtson, "Estimating Economies of Scale," *Journal of Farm Economics*, Volume XL, No. 3, August 1958.

can be determined by setting the first derivative of the average cost curve equal to zero and solving for volume:

$$\frac{dAC}{dv} = V^{-1}(abV^{b-1} + c(\pi D)^{-1/2}V^{1/2}) - V^{-2}(aV^b + \frac{2}{3}c(\pi D)^{-1/2}V^{3/2})$$

Setting $dAC/dv = \text{zero}$,

$$(3) \quad V^{3-2b} = \frac{9a^2\pi D(1-b)^2}{c^2}$$

The volume varies directly with the density of milk production and the ratio of processing costs to volume, and inversely with the cost of hauling milk and the rate of change in the ratio of processing costs to volume.

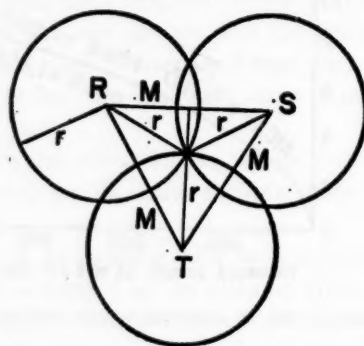


FIGURE 3. SPACING PATTERN OF PLANTS (FIRST APPROXIMATION)

While some of the equipment of a milk processing plant is lumpy, the majority of the costs, such as a dryer and the building, are not. Thus a continuous curve would, almost but not quite, fit the actual situation. The assumption made here is that it does fit the real world.

When the total cost function of the type of plant under consideration has the log of a equal to $-.512992^8$ and b equal to $.65455$,⁸ with c equal to $.00007$ per pound-mile and D equal to 296 pounds per day per square mile, the volume in the plant would be $1,206,850$ pounds of milk per day. The distance needed to travel to obtain this milk is the radius r of the assembly area where $r = \sqrt{V/\pi D}$ or 36.02 miles.

Then processing plants are located at R , S and T (figure 3) and they assemble milk from an area with radius equal to r . The plants would be located M miles apart where

⁸ Linley Juers, "An Economic Analysis of the Operating Costs of Butter-Powder Plants with Particular Reference to the Problems of Joint Costs," unpub. Ph.D. Thesis, Univ. of Minn., July 1957. Computed from data on page 95.

$$\frac{M}{2} = r \sin 60^\circ$$

$$M = 2r \sin 60^\circ = 62.4 \text{ miles}$$

4. *The hexagon vs. circle.* Another problem arises. The distance r a plant should cover to assemble a given quantity of milk and the distance between plants, M , has a downward bias. This is because the assembly area is not a circle but a hexagon (figure 4), because of the location of the other plants.⁹ The distance h to the closest edge of the hexagon area is less than the distance to the apex, r . This means that the hexagon contains less volume than the circle and as milk is assembled from the area where the radius is greater than h and less than r (shaded area, figure 4) the volume increases at a decreasing rate.

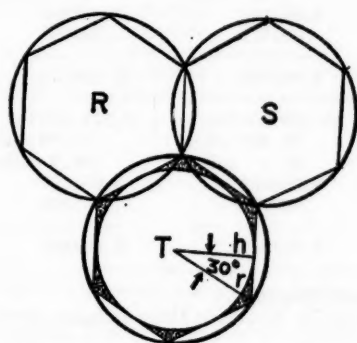


FIGURE 4. SPACING PATTERN OF PLANTS (CORRECTION)

But we also know the upper limit of this bias since we know all the angles of the triangle and one of the sides, r .

$$(4) \quad \begin{aligned} h &= r \cos 30^\circ \\ r &= \frac{h}{\cos 30^\circ} = \frac{h}{.86603} \end{aligned}$$

Then the upper limit of this range would be where r equals h . In our example this would be 72.04 miles. Then suppose that our best estimate of the optimal distance to the apex of the area is half way between these two limits r' .

$$(5) \quad r' = \frac{r}{.933015}$$

⁹ Lösch comes up with this shape of the area in his application, *op. cit.*, p. 110.

TABLE 1. RELATION OF DENSITY OF MILK PRODUCTION AND COST OF TRANSPORTATION ON SIZE OF PLANT, DISTANCE BETWEEN PLANTS, AND AVERAGE COSTS¹

Marginal hauling costs	Density of milk production per square mile-pounds per day		
	1,600 ² (Carver County, Minnesota)	296 ³ (Minnesota Average)	41 ³ (Northeastern Minnesota)
Dollars per lb.-mile			
.0000984 (can)	2,918,000 lbs. ⁴ 22.415 miles 38.824 miles \$.001978 .001367 \$.003345	810,200 lbs. 31.64 miles 54.8 miles \$.002795 .001929 \$.004724	251,690 lbs. 41.24 miles 71.4 miles \$.004182 .002889 \$.007071
.000074 (farm bulk tank truck)	3,273,650 lbs. 27.35 miles 47.4 miles \$.001725 .001177 \$.002902	1,206,850 lbs. 38.61 miles 66.9 miles \$.002433 .001681 \$.004114	374,890 lbs. 57.83 miles 100.2 miles \$.003647 .002518 \$.006165
.000025	14,400,000 lbs. 57.384 miles 99.4 miles \$.001033 .000714 \$.001747	5,311,200 lbs. 81.00 miles 140.3 miles \$.001460 .001008 \$.002468	1,650,000 lbs. 121.3 miles 210.1 miles \$.002184 .001509 \$.003693

¹ Plant used at 75 percent of capacity.² Computed from Figure 2, *The Minnesota Dairy Industry*, Agricultural Extension Service, October 1955.³ 1st figure: Volume, pounds of milk per day.

2nd figure: Maximum miles from plant needed to obtain milk.

3rd figure: Mileage between plants.

4th figure: Average costs of processing per pound of milk.

5th figure: Average costs of assembly per pound of milk.

6th figure: Total average costs of assembly and processing per pound of milk.

⁴ 70 percent of the can hauling costs.⁵ *Regulations Affecting the Movement and Merchandising of Milk*, Marketing Research Report No. 98, AMS, USDA, June 1955, p. 91.

B. Comparisons that can be made with this technique

1. *Between different densities of milk production and hauling costs.* The volume, distance between plants, and average costs of processing and assembly are computed for three different densities and three different costs of hauling milk (table 1). The cost of hauling milk in farm bulk tank trucks is assumed to be 30 percent less than in cans, or \$.00007 per pound-mile. If cow pools become an important factor in dairy production the milk would be picked up by a tractor and tank trailer with a marginal cost of \$.00002 per pound-mile, instead of a farm bulk tank truck.¹⁰

¹⁰ *Regulations Affecting the Movement and Merchandising of Milk*, Marketing Research Report No. 98, AMS, USDA, June 1955, p. 91.

TABLE 2. RELATIONSHIP OF RATIO OF FIXED COSTS TO VOLUME AND COST OF TRANSPORTATION ON SIZE OF PLANT, DISTANCE BETWEEN PLANTS, AND AVERAGE COSTS¹

Marginal hauling costs	Butter-powder plants (Ratio of fixed costs to volume—high, log $a = -.512922$)	Cheese factory-creamery-centralizer. (Ratio of fixed costs to volume—low, log $a = -.81389$) ²
Dollars per lb.-mile .0005 ³ (cans, horses)	117,940 lbs. ⁴ 12.07 miles 20.9 miles \$.005433 .001502	52,030 lbs. 8.018 miles 13.9 miles \$.003605 .000997
	\$.006935	\$.004602
.0000984 (cans, truck)	810,200 lbs. 31.64 miles 54.8 miles \$.002795 .001929	356,950 lbs. 21.0 miles 36.4 miles \$.001853 .001281
	\$.004724	\$.003134
.0000075 (cans of cream, rail)		7,464,500 lbs. 96.038 miles 166.3 miles \$.000648 .000448
		\$.001096

¹ Plants used at 75 percent of capacity and an area having an average density of milk production.

² Ratio assumed to be one-half that of a butter-powder plant.

³ Cost of hauling with horses assumed to be five times the cost of hauling with trucks.

⁴ See footnote 3, Table 1.

2. Among creameries, cheese factories, centralizers, and butter-powder plants.

If a creamery or cheese factory has only one-half of the fixed costs per unit of volume as does a butter-powder plant, the optimal size will be much smaller. These results are shown in table 2.

The use of formula (3) also explains why small creameries could exist among large centralizers in the early part of this century. The farmers delivered cream to the small creameries with horses and, if the volume was so small that the processing costs were greater than those of the centralizer plus rail transportation, the cream would be sent to the centralizer. Then in areas of heavy production, small creameries existed, and in areas of light production the cream was shipped to centralizers.

The introduction of the motor truck also has increased the size of cheese factories and decreased their number.

3. *Seasonality.* For quite some time researchers in dairy marketing have been attempting to measure the cost of processing milk with the present seasonal pattern as compared with a constant supply. This can be done by

changing the relationship of fixed costs to volume as percent of capacity is increased (table 3). Changing this relationship as percent of capacity is decreased gives us a measure of the additional costs of handling the surplus milk of a fluid market.

C. Relaxing some assumptions

This analysis has been carried out using the approach of least cost which is realistic for a cooperative. But suppose that the fifth assumption is re-

TABLE 3. RELATIONSHIP OF PERCENT OF CAPACITY TO SIZE OF PLANT, DISTANCE BETWEEN PLANTS, AND AVERAGE COSTS¹

	Percent of capacity		
	65% (Duluth-Superior Class II)	75% (Minnesota average)	100%
Volume, pounds per day	266,640 lbs.	251,690 lbs.	222,730 lbs.
Max. distance needed to gather milk	42.448 miles	41.24 miles	38.796 miles
Distance between plants	73.5 miles	71.4 miles	67.2 miles
Average costs, processing	\$.004138 per lb.	\$.004182 per lb.	\$.004273 per lb.
Average costs, assembly	.002974 per lb.	.002889 per lb.	.002718 per lb.
Average costs, total	\$.007112 per lb.	\$.007071 per lb.	\$.006991 per lb.

¹ Plants using cans and having a low density of milk, such as Northeastern Minnesota.

laxed. A private firm would not find its greatest profit at the point of least cost but rather at the point where marginal costs equal marginal revenue. If entry into the processing industry could be limited, a private firm would have plants larger and farther apart than a cooperative. This is because it would not take supply as given but must treat it as a function of price. In other words, D in formula 3 is not a constant but a function of price. This also removes part of the first assumption: a given rate of milk production.

If this firm could not limit entry into the processing industry, other firms would start between the plants of the first firm. As a result, the plants of the first firm would be located farther apart but the volume of milk would be smaller, as some of the milk would go to other plants in the area. The density D of milk production would be lower, which would push the size of plant to the left and higher up on the long-run planning curve.¹¹

The fourth assumption can be relaxed so that there is a positive cost of transportation of the finished product. If this did not vary with the size of plant it would have no effect on the size of plant, but only on the location of the plant within its assembly area. With respect to the center of the as-

¹¹ Lösch also finds that the equilibrium point is to the left and higher on the long-run planning curve when demand is evenly distributed, *op. cit.*, p. 108-109.

sembly area the plant would be located toward the market for the finished product. The relative distance between the center of the area and the plant would be proportional to the ratio of transportation rates of the finished product to transportation rates of the raw material.

If the cost of transportation of the finished product varied with the size of plant, then this cost would have to be included as a marketing cost in the long-run planning curve of the firm.

We are left with three assumptions:

1. Milk is produced evenly over an area.
2. Transportation costs are even throughout the area.
3. There is perfect competition on the selling side in the market for the manufactured product: butter, powder, and cheese.

These assumptions are fairly realistic. When a whole district is considered, milk production may be imagined to be fairly uniform. Transportation costs may vary within an area but if the first and last patrons of a route were all on first class roads the transportation rate would be even. It has been mentioned above that there is close to perfect competition in the market for butter, powder, and cheese.

IV. Conclusion

This technique is useful because, given the density of milk production and cost of transportation, a large cooperative could determine what size of butter-powder processing plants should be built and how far apart they should be. It is useful to explain the economic consequences of bulk tank transportation compared with can transportation to farmers.

It explains one of the competitive advantages that large centralized milking plants may have over conventional dairy farming. It is useful for explaining why cream creameries and cheese factories were small and close together, why large centralizers could exist along with small cream creameries, and why modern butter-powder plants are larger and farther apart. It also can be used to determine the costs of processing a fluctuating milk supply.

Other factors need to be considered in determining the exact location of the plants. Their exact location would be determined by (1) conditions that lower transportation costs, such as being at the intersection of local transportation routes or being on a gas pipe line, and (2) conditions that lower other costs such as local property tax need and the availability of water.

The location problem of other types of agricultural processing which involve a large weight loss could similarly have this technique applied. This is especially significant when new agricultural processing industries are introduced in underdeveloped countries.

There is a need for more accurate costs of procuring milk under various methods. Also the ratio of costs to volume and the rate of change in cost to volume should be explored for larger plants. The largest plant used in determining these coefficients has a capacity of only 350,000 pounds of milk per day and this analysis indicated that plants larger than 5,000,000 pounds per day may be optimal. There are plants in existence with a daily capacity of 2,000,000 pounds.

DISCUSSION: LOCATION THEORY AS APPLIED TO MILK PROCESSING PLANTS

CHARLES E. FRENCH
Purdue University

Mr. Olson is to be congratulated and commended for his fine paper. The model he has developed has several characteristics of respect.

His model is addressed to an important problem. Olson tended to justify his model on its value to the dairy industry in transition to larger plants. I might not infer this temporary value; plant consolidation and location problems are probably permanent. A growing national food market, serviced increasingly by regional and national organizations, emphasizes the food plant location problem as a key one. Of course, the basic plant location problem lies in the concept of a market itself. This confounds us so often in our food processing complex.

The model has originality. It suggests a new approach; yet, it is couched in the setting of previous work. I profess some disappointment that the literature orientation is not more complete. Spatial equilibrium and linear programming approaches to the location problem have not been mentioned. This disappointment is real; an approach to a problem must be considered in light of other alternatives. The merits of this model relative to these couched in matrix algebra must be discussed later.

The model is definitive. This is welcome. General suggestions for some time have held the theories of Von Thünen and Weber applicable to location problems. Study of dairy plant location on a national or even a state basis, lends emphasis to this point.¹ To be more definitive in stating the case is good.

The model is apparently applicable to real problems. Olson demonstrates variations and does relax certain of his assumptions as his paper progresses. He was rather straightforward in handling the curvilinearity

¹ Hardin, C. M., *The Supply and Utilization of Milk in Indiana*, Purdue Univ. Expt. Sta. Bull. 462, August 1941, pp. 21-27.

of plant cost functions, and certainly he put the focus on size of firm. Yet, on applicability, I have more to say.

His model is provocative. This aspect prompts most of my remarks. Olson illustrates and discusses most points on which I comment. Yet, his comments generally intrigue and provoke me to want to push them farther. This element of provocativeness is suspected as his basic objective for the paper.

My two major points involve: (1) the tendency of the model to over-emphasize the supply side of the location problem relative to the demand side, and (2) the apparent inadequacy of the model to handle certain rigidities of real-life problems of food processing plant location.

Plant location involves both supply and demand. Olson attempts to illustrate this point by saying that demand will primarily influence plant location only within the procurement area. Yet, for the size of plant he infers, location within the procurement area is probably more important than the distances among plants.

Historically the alignment of production and consumption of milk is an interesting one. Such locations have come about not entirely because of dairy economics. The general economic complex has overshadowed the industry situation more than we realize. It is somewhat of a happenstance, from the point of view of dairy economics, that general economic conditions placed the major population centers in the same areas of the country in which our farm management resources tended to locate our milk production. This situation and its ramifications for plant location are not generally handled by this model with its preoccupation with supply.

Spatial equilibrium and transportation linear programming models have shown great potential for considering simultaneously both supply and demand factors. Relationships between finished product and raw material transportation costs are only a small part of a location problem. Even if this were the bulk of it, the sheer size of distribution costs relative to processing and procurement costs would raise questions.

The location problem is bound up in the complicating problem of inter-regional competition.² The effect of the competitive structure upon size, type and location of plants seems hardly manageable within this model. It is not quite feasible to assume that we can freeze out competition on the selling end, and plan plant locations accordingly. Olson hints at this point but his discussion was not too convincing.

The changing conversion ratios between finished product and raw material ingredients suggest greater emphasis on demand in plant loca-

² Snodgrass, M. M. and Charles E. French, *Linear Programming Approach to the Study of Interregional Competition in Dairying*, Purdue Univ. Expt. Sta. Bull. 637, May 1958.

tion. Kiehl,³ and others make interesting projections relative to market-oriented plants because of this factor.

This basic criticism of the model probably lies in the assumption of Olson that a cooperative works on a least-cost rather than a profit-maximization principle. This assumption seems unrealistic.

The second problem—the inadequacy of the model to handle rigidities of real-life situations—is brought into focus when one remembers the rather odd shape of the procurement areas developed in the original work of Cassels.⁴ One finds the same thing in more recent work such as that of Bredo and Rojko.⁵ Also, procurement areas in most sections show little curvilinearity. Of course, concentrated dairy areas tend more to meet the supply assumptions of Olson's model than do fringe areas. Again the mathematical approach which allows us to handle linear relations involving many restrictions and rigidities has appeal. Location problems are long run and tend to get away from certain curvilinear aspects which bother us in normal plant-planning problems. For example, Olson is on safe ground in handling his plant costs, but it is more doubtful when it comes to his assembly costs. As we spread a milkshed for long-run growth, we tend to get larger distances among producers as well as larger distances from the plant to the first and last producer on the route. Olson's hexagonal modification is a good start in the right direction, but I am afraid it is not adequate.

Milk supply is a many-sided thing today. Probably one-third to one-half of our manufactured dairy products are made from surplus bottling grade milk. Problems of supplemental supply and uneven distribution of supply throughout areas and time make the simplifying assumptions of this model dangerous.

A reasonable hypothesis today is that manufacturing plants err in assuming a rather fixed milk supply and resist paying more than a nominal premium to secure additional supplies. Our work on marginal values of additional supplies with given plant facilities and locations suggests larger premiums.

The mobility of milk supplies today is important to multiple-firm operations. Therefore, to design a plant location with a fixed milk supply is not in line with the fact that plants can and do shift supplies among plants. With proper programming techniques and adequate information, our studies suggest even more shifting may be economical.

³ Kiehl, E. R., "Changing Patterns in Production and Consumption of Animal Products," *Proceedings of Institute of Animal Agriculture*, Purdue University, 1959.

⁴ Cassels, J. M., *A Study of Fluid Milk Prices*, Harvard University Press, 1937.

⁵ Bredo, W. and A. S. Rojko, *Prices and Milksheds of Northeastern Markets*, Mass. Agr. Expt. Sta. Bull. 470, August 1951.

My basic criticism in inadequacy of the model probably lies in the assumption implied in the paper that we can divorce one segment of the dairy industry from another. The interrelations are important and growing in number. A model to approach them must be adaptable and comprehensive.

This model prompts suggested modifications. Possibly it could be integrated with its handling of plant costs into a mathematical programming model, with its flexibility for interrelationships, which in turn could be supplemented with proper simulation techniques to handle the stochastic characteristics of the location problem. Such a combination is probably necessary to make a major contribution.

The unique characteristics of modern storage suggest that incorporation of storage possibilities into a plant location model has merit. For example, to locate a plant or procure milk predicated upon prices designed to even out seasonal milk supplies may be archaic. Our experience with simulation techniques for planning plant operations suggest a potential field of study here.

Of course, this model expanded to give reasonable criteria for defining market areas in the full economic context would be a major contribution.

REPORTS AND MINUTES

ANNUAL REPORT OF THE PRESIDENT

The progress of our Association is best documented by the committee reports that follow. The remarks of the President, therefore, will be brief. In general, I can report a successful year. As the Secretary-Treasurer will explain in more detail, there has been a significant growth in membership—a growth largely attributable to the efforts of Howard Diesslin and his Membership Committee. The larger membership brought an increase in income, which enabled the Association to cover all costs (including the Awards Program) and still to show a comfortable cash balance.

I gladly take this traditional opportunity to express my personal thanks to the many members who have worked for the Association during the past year. Most of these men are named in the list of committees that is appended to these reports. I call particular attention to Del Kearn, who has most effectively assumed the duties of Secretary-Treasurer; to G. W. Hedlund and his entire staff at Cornell whose arrangements have been unbelievably fine; to the members of the Executive Committee—each one has been pressed into service on a variety of assignments; to Bob Clodius and his Associate Editors and Council for their excellent work on the *Journal*.

The Awards Committee has continued to perform its laborious duties with a deceptive air of ease: all members deserve praise from the Association, with special thanks to Chairman Southworth and to Subcommittee Chairmen Bottum, Judge, Brown, and Trelogan. The Subcommittee on Student Activities must be singled out for its particularly good job on a burdensome assignment, and I express my personal thanks to Chairman Ball and the other members of his group. R. A. King has continued his good work with the Employment Committee and with Dick Aplin's help has improved our procedures, as I hope this meeting shows. Joe Ackerman and Howard Diesslin of the Farm Foundation have served the Association in a wide array of assignments. Ivy Duggan has continued to work on Sustaining Membership and with the support of the Executive Committee promises an intensive effort in that direction in the year ahead.

Finally, I turn to the Program Committee for this meeting. John Doneth represented the North Central Extension Economists in organizing a special section meeting, R. L. Tontz carried much of the burden of sessions devoted to foreign agriculture and development, while Walt Ebling and his committee were responsible for the session on agricultural data. M. E. John represented our Association and the Rural Sociologists in formulating the joint meeting for Wednesday morning and with Ken Bachman assisted in organizing section meetings on rural development. Stan Seaver and Vern Ruttan were most helpful in planning the series of meetings on regional economics and interregional competition. My colleagues at California were very generous with their time and suggestions; I acknowledge my debt to them, especially George Mehren and Norman Collins for their work on competition in the food industries. To these and many others who have helped during the past year, the President gives heartfelt thanks.

Before turning the meeting over to the reports of other officers and committees, I want to discuss briefly a special matter of deep concern to your Executive Committee.

As all at this meeting know, L. J. Kutish circulated a letter to AFEA members in April, 1959, indicating that he was renouncing membership in the Association and terminating his subscription to the *Journal*. He stated that, during his membership in our Association, he had been the victim of widespread and repeated plagiarism of professional material. As many of you know, he circulated a similar letter to members of the American Economic Association.

Your officers have not considered this charge lightly. Through correspondence and personal contact, we have attempted to discover the basis for Kutish's belief. I will not attempt to report in detail on our activities in this case. In brief summary, however, we have taken the position that this is a serious matter but that it cannot be explored on the basis of vague and general charges. The American Economic Association has followed a similar approach. Both Associations have indicated to Kutish that they will proceed with further and detailed investigations if and when Kutish makes his charges specific enough to permit such investigation.

R. G. BRESSLER, JR.
President

REPORT OF THE SECRETARY-TREASURER 1958-59

Membership

The Association continues to grow in all membership categories (Table 1). Although it is difficult to measure, part if not all of the growth in numbers of regular members is due to the excellent work of this year's Membership Committee. The increase in numbers of corresponding members is the fruition of work done in previous years by your Corresponding Membership Committee in establishing the contractual arrangements for corresponding members with the International Cooperation Administration.

TABLE 1. AMERICAN FARM ECONOMIC ASSOCIATION:
MEMBERS AND SUBSCRIBERS, JUNE 30, 1959, WITH COMPARISONS

Classification	1955	1956	1957	1958	1959	Change 1958-59
Sustaining members				7	9	2
Regular members	1,796	1,960	1,998	2,022	2,115	93
Corresponding members	—	—	—	44	122	78
Junior members	149	284	321	293	295	2
U. S. libraries and firms	269	335	320	316	356	40
Foreign libraries and firms	351	425	472	467	566	99
Exchanges	1	1	8	15	17	2
Total	2,566	3,005	3,119	3,164	3,480	316

Growth in these areas, plus the increasing numbers of domestic and foreign libraries that are subscribing to the *Journal of Farm Economics*, attest the feeling of the general public as to the need for an association such as ours and to some extent attest the degree to which we are satisfying that need.

Cash receipts and expenses

Association cash receipts exceeded expenses by \$5,093.91 (Table 2). Membership dues and subscriptions increased corresponding with the increased numbers of members. Sales of reprints more than doubled, but income from *Journal* advertising was down. The latter is partly due to the fact that 1957-58 income included some Directory handbook advertising receipts.

Expenditures generally were in line with the previous year. *Journal* printing was almost as high as in 1957-58 (which included payment for the May 1957 issue) because of the large Proceedings Issue.

During the year \$7,885.54 in excess operating funds were used to purchase U.S. Treasury bills. The mature value of these is \$8,000.00 and is due July 2, 1959.

Net gain

Although the net cash income was \$5,093.91, part of this was a prepayment of dues and subscriptions for 1960 and 1961 and a return of \$1,000 loaned to the local arrangements committee for our 1958 meetings at Winnipeg. Considering these items of income not accruing to the current year, the net

TABLE 2. AMERICAN FARM ECONOMIC ASSOCIATION: CASH RECEIPTS AND DISBURSEMENTS FOR THE YEAR ENDING JUNE 30, 1959
(INCLUDING SPECIAL GRANTS FUNDS EXPENDITURE)

Cash on hand July 1, 1958.....	\$ 9,057.79
Receipts:	
AFEA dues and subscriptions.....	\$29,851.85
WFEA dues.....	531.00
CAES dues.....	527.90
ICA dues.....	2,252.00
Sale of back issues.....	1,687.93
Sale of reprints.....	3,080.83
Advertising.....	201.00
Annual meeting.....	1,240.48
Interest and dividends.....	2,659.78
Miscellaneous.....	140.04
Total receipts.....	\$42,172.81
Disbursements:	
Journal printing.....	\$26,568.96
Editing fees.....	1,662.00
Printing of reprints.....	2,242.62
Purchase of back issues.....	37.00
WFEA & CAES dues remitted.....	1,058.90
Awards program.....	2,334.81
Annual meeting expenses.....	1,252.65
Postage and telegrams.....	505.87
Office supplies.....	656.57
Move Sec.-Treas. office.....	315.34
Subscription refunds and misc.....	444.18
Expenses.....	\$37,078.90
Net cash income (receipts minus expenses).....	5,093.91
Total.....	\$14,151.70
Treasury bills purchased (due July 2, 1959).....	-\$ 7,885.54
Balance in checking account June 30, 1959.....	\$ 6,266.16

gain of the Association during the year was \$2,598.81 (Table 3). This is more favorable than it at first appears. The cash expenses included costs of the awards program of \$2,334.81 and the large Proceedings Issue.

Balance sheet

There were no changes in the securities held by the Association during the year except for the purchase of the U.S. Treasury bills which are due July 2, 1959. When these securities are valued at cost the Association shows an increase in net worth of \$3,598.81 (Table 4). Part of this was the return of the advance to finance the 1958 meetings. This was not shown as an account receivable in the 1958 financial report. Offsetting part of the increase in assets is an increase in liabilities in the form of prepaid corresponding members' dues and institution, library subscriptions.

When the assets of the Association (valued at cost) were divided between general accounts and the accounts of the special grants or awards activities the net worth of the Association, exclusive of these special funds, increased by \$5,777.12. (The adjustment for special funds is shown in Table 5.)

TABLE 3. AMERICAN FARM ECONOMIC ASSOCIATION:
NET GAIN DURING YEAR ENDING JUNE 30, 1959

Net cash income.....		\$5,093.91
Less:		
Increase in prepaid subscriptions and dues.....	\$1,495.10	
Return of advance for 1958 meetings.....	1,000.00	2,495.10
		<u>\$2,598.81</u>

TABLE 4. AMERICAN FARM ECONOMIC ASSOCIATION:
BALANCE SHEET, JUNE 30, 1959

ASSETS		
Cash.....		\$ 6,266.16
Investments (at cost)		
Treasury bills.....	\$ 7,885.54	
Treasury bonds.....	24,045.54	
Chi., Mil. & St. Paul bond.....	971.81	
Stocks.....	25,983.32	
Total investments.....		58,886.21
		<u>\$65,152.37</u>
LIABILITIES AND NET WORTH		
Defered Credit		
Prepaid membership dues ¹		\$ 2,700.10
Net Worth		
Balance June 30, 1958.....	\$58,853.46	
Return of advance for 1958 meetings.....	1,000.00	
Excess of income over expenses.....	2,598.81	
Net worth June 30, 1959.....		\$62,452.27
		<u>\$65,152.37</u>

¹ Dues and subscriptions for 1960 and 1961.TABLE 5. AMERICAN FARM ECONOMIC ASSOCIATION: NET WORTH EX-
CLUSIVE OF SPECIAL GRANTS FUNDS, JUNE 30, 1959

ASSETS		
Net Worth, Table 4.....		\$62,452.27
Less:		
Balance, Special Grants Fund.....	\$3,038.24	
Balance, Graduate Student Fund.....	100.00	
		<u>3,138.24</u>
Net Worth Exclusive of Special Grants.....		\$59,314.03

Special Grants Fund

The balance in the Special Grants Fund for the awards program at the end of the year was \$3,038.24 (Table 6). Expenditures were \$2,334.81. Interest income of \$156.50 was assigned to the fund.

TABLE 6. AMERICAN FARM ECONOMIC ASSOCIATION: TRANSACTIONS AND
BALANCE IN SPECIAL GRANTS FUND, 1958-59

Beginning balance and income:	
Balance July 1, 1958.....	\$5,216.55
Interest earned ¹	156.50
Total.....	\$5,373.05
Disbursements:	
Awards and direct expense of program.....	2,334.81
Ending balance.....	\$3,038.24

¹ Share of earnings assigned to fund.

Summary

This report is favorable. The following are highlights:

1. Membership has increased in all categories.
2. Even with heavy printing expenses and the cost of the awards program, the net gain was \$2,598.81.
3. Although ICA revenue will decline, other membership and subscription income can be maintained with an active membership campaign.
4. The net worth of the Association, including all funds, is up by \$3,598.81 with all securities valued at cost, and by \$22,247.19 with securities valued at market price.
5. The net worth of the Association with securities valued at market price was in excess of \$106,405.29 at the end of the year.

This year has been a successful year in the office of the Secretary-Treasurer. Thanks to the help of the past Secretary-Treasurer Lowell Hardin, the office was moved to Ithaca without undue stress. The present Secretary-Treasurer found the books and records in excellent condition. They and the procedures established by Dr. Hardin have been adopted and found to work smoothly and effectively. There have been some mistakes made but we have learned from these and ask your indulgence where you have been inconvenienced. I appreciate the contributions of the individuals and institutions which have made this first year as your Secretary-Treasurer a pleasant and successful one.

C. D. KEARL
Secretary-Treasurer

REPORT OF AUDITING COMMITTEE

At the request of the officers of the Association we have examined the accounts, records and statements prepared by the Secretary-Treasurer, Dr. C. Del Mar Kearl, for the year ended June 30, 1959.

We have compared the cash receipts book totals with the totals for the various income categories, with the deposit totals in the checkbook and bank statements and with the totals in the cash receipts section of the annual statement prepared by the Secretary-Treasurer and have found them to be completely and accurately recorded and reported. We have compared a sample of the individual membership receipts entries with the membership card file and have found them accurately recorded.

We have verified each disbursement against the vouchers, canceled checks

and bank statements. We have verified the totals of the various categories of disbursements against the grand total in the cash disbursements book and against the expenditures reported in the statement of expenditures prepared by the Secretary-Treasurer.

We have reconciled the bank balance as of June 30, 1959 with the check-book balance.

We inspected at the Tompkins County Trust Company, Ithaca, New York, securities appearing on the list submitted by the Secretary-Treasurer and found them to be completely and accurately reported.

In our opinion the statements prepared by the Secretary-Treasurer accurately reflect the financial operation of the Association for the year ended June 30, 1959, and the status of its finances as of that date.

We congratulate the Secretary-Treasurer and his assistants upon the complete and accurate records which have been kept.

We strongly recommend that because of the size and complexities of the Association finances, the Secretary-Treasurer with the approval of the President be authorized to retain a Certified Public Accountant to prepare between June 30 of each year and the date of the annual meeting an audit of the Association's records and accounts for the preceding year.

T. N. HURD

R. S. CARPENTER

REPORT OF THE ELECTION TELLERS

The 1959 Committee of Tellers counted the ballots with the following results:

President Elect	William H. Nicholls
Vice Presidents	Nathan M. Koffsky
	Lowell S. Hardin
	E. A. LUTZ, <i>Chairman</i>
	<i>Committee of Tellers</i>

REPORT OF THE EDITOR

JOURNAL OF FARM ECONOMICS

In view of the fact that the 1,970 pages published in 1958 were the largest in the *Journal's* history, the Editor's office has been a busy one.

The acceptance rate during the past year has remained at about 50 per cent of manuscripts received. Of the 50 per cent accepted, about half have undergone substantial revision and the remainder have benefited from the comments of reviewers.

This work represents a great amount of time and intellectual effort on the part of reviewers. Insofar as possible, manuscripts are sent to the best qualified referees in the profession. These include persons both on and outside the Editorial Council.

I wish to express my deep appreciation to members of the Editorial Council, to my colleagues at the University of Wisconsin, and to the following *ad hoc*

editorial assistants: Karl Fox, Iowa State University; Charles Hardin, University of Chicago; James Hassler, University of Nebraska; Wilbur Maki, Iowa State University; Sydney S. Miller, Social Security Administration; Frank Orszem, Kansas State College; Gerald Quackenbush, Michigan State University; Fletcher Riggs, Tennessee Valley Authority; J. Herbert Synder, University of California, Davis; James Stalling, New Mexico State University; J. D. Stewart, Canterbury Agricultural College, New Zealand; J. M. Tinley, University of California, Davis; Walter Wills, Southern Illinois University; Lawrence Witt, Michigan State University; and from the United States Department of Agriculture, Ralph R. Botts, J. B. Claar, Martin J. Gerra, Louis F. Herrmann, William C. Pendleton, Jr., Horace L. Puterbaugh, and A. S. Rojko.

My special thanks also go to my friend and colleague, Willard F. Mueller, as Associate Editor and to George Judge, E. J. R. Booth and W. B. Back who competently and conscientiously served the office of Book Review Editor.

Most articles and notes in the *Journal* are contributed by authors. Accepting and reviewing only contributed manuscripts is a safe procedure for the Editor because something solicited might not be of publishable quality. However, as an experiment over the past year you have read four solicited pieces. They include Henry Wallace's "Further Facts on Raising the Price of Gold," Marion Clawson's "Policy for Commercial Agriculture Re-examined: A Review Article," Richard Kirkendall's "Four Economists in the Political Process," and "On Agricultural Policy: A Symposium" by Professors Murray Benedict, George Bradow, Dale Hathaway, Ray Penn, and T. W. Schultz.

I hope you have enjoyed these solicited manuscripts as well as the contributed articles. The Editor seldom knows the response to his efforts because no adequate feedback exists. In two years I have received no letters of either commendation or damnation about the content of the *Journal*. Some complaints were made to me about the size of the 1958 Proceeding Issue but, ironically, this is the one issue over which the Editor has no control.

My resigning a year before the end of the usual term of office is an attempt to reallocate scarce resources to continuing research on the imperfect market structures that burden, obstruct, or affect agriculture. My conscience in passing a responsibility on ahead of schedule is eased completely in my knowledge of the competence of the incoming Editor, Herman Southworth, and of the continuing Editorial Council. I wish to express again my thanks to all named persons and others without whose cooperation there would be no *Journal of Farm Economics*.

ROBERT L. CLODIUS
Editor

REPORT OF THE AWARDS COMMITTEE

The Awards Program of the Association this year was conducted along similar lines to last year's program (see pages 1,946-51 of the 1958 *Proceedings*), the only change in the announced rules being deletion of the restriction, in connection with the Awards for Papers Contributed by Graduate Students, that they come from departments "in the United States." It was felt that such a restriction had no practical necessity and was in principle contrary to the spirit of the Program.

Considerable rotation of membership on the Subcommittees was made this year in order to relieve persons who had previously served for several years. Names of the Chairmen and Members of the Subcommittees appear elsewhere in these Reports. These individuals deserve the fullest thanks from the Association for their substantial contribution of time, energy, and judgement in conducting the Awards program. Indeed, the Chairman has sometimes been tempted to suggest that they, as well as the Awards winners, deserve certificates of commendation.

Participation in the several contests, and the Judges selections in each case, were as follows:

Awards for Published Research

Some forty publications were submitted for consideration for Awards for Published Research. The papers selected were:

GLENN LEROY JOHNSON, "Supply Function—Some Facts and Notions," published in *Agricultural Adjustment Problems in a Growing Economy*, Iowa State College Press. Submitted in the field of Farm Management and Production Economics.

MARC NERLOVE, *Distributed Lags and Demand Analysis for Agricultural and Other Commodities*, Agricultural Handbook No. 141, United States Department of Agriculture. Submitted in the field of Theory and Methodology.

EDWARD FRANKLIN RENSHAW, *Toward Responsible Government: An Economic Appraisal of Federal Investment in Water Resources Programs*, Chicago: Idyia Press. Submitted in the field of Land and Water Economics and Conservation.

Each of these individuals receives the Awards Certificate of the Association, along with a check in the amount of \$250.

In addition, the Judges selected the following publications as meriting Honorable Mention, and Certificates to this effect are presented to their authors:

M. MASON GAFFNEY, "Urban Expansion—Will It Ever Stop?" published in *Land*, the 1958 Yearbook of Agriculture, United States Department of Agriculture. Submitted in the field of Land and Water Economics and Conservation.

ZVI GRILICHES, "The Demand for Fertilizer: An Economic Interpretation of a Technical Change," *Journal of Farm Economics*, 40:591-606 (August 1958). Submitted in the field of Theory and Methodology.

RICHARD D. APLIN, "Country Reload Plants for Bulk Milk—Specifications and Costs," Cornell University Agricultural Experiment Station, AE-Res.-1. Submitted in the field of Marketing.

Awards for Ph.D. Theses

Ph.D. theses in agricultural economics were submitted from twelve institutions this year. In general, the level of accomplishment was high. The following were selected for Awards Certificates and checks for \$250 each:

ALVIN CHARLES EGBERT, "Programming Regional Adjustments in Resource Use for Grain Production," Iowa State University.

ROBERT L. GUSTAFSON, "Carryover Levels for Grains," University of Chicago.

LOY L. SAMMET, "Economic and Engineering Factors in Agricultural Processing Plant Design," University of California.

In addition, the Subcommittee has recommended for Honorable Mention:

CLARK EDWARDS, "Resource Fixity, Credit Availability and Agricultural Organization," Michigan State University.

Award for Best Article in Journal of Farm Economics

Again as in previous years, the Editors and Editorial Council had the task of selecting for an award one from among the many excellent articles contained in our *Journal* last year, and again the selection was difficult. Chosen for the Award of \$250 was:

RUEBEN C. BUSE, "Total Elasticities—A Predictive Device," November, 1958.

Recommended for Honorable Mention:

GERALD W. DEAN and **EARL O. HEADY**, "Changes in Supply Response and Elasticity for Hogs," November 1958.

Awards for Papers Contributed by Graduate Students

Papers in this contest are judged by the Student Activities Committee, and details of this year's contest and the winners are included in the Report of that Committee.

HERMAN M. SOUTHWORTH, *Chairman
Awards Committee*

REPORT OF THE SUBCOMMITTEE ON STUDENT ACTIVITIES

1. Graduate Student Contributed Papers Contest

There is a limit of one paper per institution in this contest. Six institutions were represented in this year's competition. The names of the institutions, the students' names and the titles of their papers are given below in alphabetical order of author:

Allee, David J., Cornell University, "Risk and Hypothesis Testing."

Badger, Daniel D., Michigan State University, "The Case for Peanuts as a Basic Commodity."

Barker, Randolph, Iowa State University, "The Problem of Transferring Technical Assistance in Agricultural Economics to Underdeveloped Areas."

Olson, Fred L., University of Minnesota, "Location Theory as Applied to Milk Processing Plants."

Wilson, David, Utah State University, "Demand for Oranges at the Producer Level."

White, W. Cleland, University of Kentucky, "The Determination of an Optimal Replacement Policy for a Continually Operating Egg Production Enterprise."

The three winners were:

David J. Allee

Fred L. Olson

W. Cleland White

I realize that a subcommittee is studying the graduate student contributed papers phase of student activities and will present recommendations. I have provided them with a detailed report of the graduate student activities during the past four years to assist them in that evaluation. The extent of institutional participation has been: 1956-12; 1957-11; 1958-6; 1959-6. Although the

number is not large and has dropped off in the past two years, the quality of papers has been very good. There is not a very large number of institutions offering graduate work in Agricultural Economics. The limit of one paper per institution reduces the number of papers at the departmental level and only one from an institution reaches our committee. Students have learned that the competition is stiff, especially for students working toward a Master's degree, whose papers will be in competition with those prepared by Ph.D. candidates. This may discourage students from institutions not offering the Ph.D. in agricultural economics.

The Home Management Society is very interested in this competition and plans to initiate a similar one to encourage young people in their science.

This committee, with the information it has to date, favors continuation of graduate student papers. We do not know the objectives set down at the time the programs were initiated. It may be that they are not being realized. Costs could, perhaps, be reduced, if that is of basic concern, without damaging interest. I have made suggestions along this line to the subcommittee studying this question.

However, if by modification of existing rules and awards it is decided that the graduate student contributed papers contest can not fulfill the objectives of the Society for such an activity, this committee naturally would favor its discontinuance.

2. Undergraduate Student Contests.

There is a public speaking contest and a debate contest again this year. No student can participate in both and only one debate team per institution is allowed. Seven institutions have indicated their intention to enter a debate team: Kansas State University, MacDonald College, North Carolina State College, Ohio State University, University of Houston, University of Minnesota and University of Missouri. Ten institutions indicated that they would have entries in the public speaking contest—perhaps as many as 17 speakers. The institutions are: Alabama Polytechnic Institute, Kansas State University, MacDonald College, Ohio State University, Pennsylvania State University, Purdue University, University of Illinois, University of Minnesota, University of Missouri, and University of Nebraska.

The public speaking topics can be on any subject of the speaker's choice in the general area of Agricultural Economics. The debate topic is chosen by this committee. This year it is: "Resolved that the decrease in farms and farm population calls for a decrease in Government Aid to Agriculture."

Several letters have been received suggesting that the debate contest be discontinued or altered. One such suggestion is to substitute a written paper contest such as we now have for graduate students. Others suggest if the debates are continued we should conduct regional contests during the year, award a trophy cup instead of personal prizes, select the topic earlier and contribute funds to help undergraduate participants attend the meetings.

The fact of the matter is that in two days of meetings debate competitions with over six teams require two sets of debates running simultaneously and two sets of judges from non-participating institutions. We really cannot handle more than eight teams even then in three periods during the annual meetings. It is felt that six or seven teams of two persons each shows good interest. The real

problem with debates is conducting them at the meetings: the time factor, difficulty in getting judges and requesting so much of their time. There is, of course, the question of the debatability of a scientific problem.

Nevertheless, although written papers would not need to involve the students' presence to win, thus reducing costs, the interest among undergraduates in such matters historically is not great and the quality of their writings is questionable. It would be difficult to determine how much of the papers presented represented their own efforts.

Likewise it is doubtful if the Association cares to become involved in conducting contests throughout the year. Certainly the chairman of this committee could not travel to several such regional contests. It might somehow be possible to marshal various AFEA members around the United States and Canada to do this if it were considered desirable.

On the financial assistance to undergraduates for attending these annual meetings, this committee feels the student sections should endeavor to raise funds for this purpose through student activities, institutions, alumni, etc.

The awarding of a trophy instead of personal prizes may have some merit to arouse and continue interest among local club members who do not themselves participate. This suggestion should be studied further by next year's committee. But at this time it is the recommendation of this committee that otherwise, the debate and public speaking contests be continued, the Association providing whatever prizes or awards are agreed upon by this Committee as in the past.

3. *New Student Sections.*

Four new clubs became active chartered sections during the year. They are:

Texas Technological College
Southern Illinois University
University of Houston
MacDonald College of McGill University

This raises the total of chartered sections to 36, of which two are Canadian. They are:

- | | |
|-----------------------------------|--------------------------------------|
| 1. Ohio State University | 19. Pennsylvania State University |
| 2. University of Tennessee | 20. University of Utah |
| 3. North Carolina State College | 21. Rutgers University |
| 4. Alabama Polytechnic Institute | 22. South Dakota State College |
| 5. University of Florida | 23. University of Wisconsin |
| 6. Mississippi State College | 24. Purdue University |
| 7. Virginia Polytechnic Institute | 25. University of Illinois |
| 8. Louisiana State University | 26. University of Massachusetts |
| 9. Iowa State University | 27. University of Georgia |
| 10. Kansas State University | 28. North Dakota State College |
| 11. Michigan State University | 29. University of Maryland |
| 12. University of Nebraska | 30. Ontario Agricultural College |
| 13. Oklahoma A. & M. College | 31. New Mexico College of A. & M. A. |
| 14. Texas A. & M. College | 32. University of Minnesota |
| 15. University of Kentucky | 33. Texas Technological College |
| 16. University of Arkansas | 34. Southern Illinois University |
| 17. Clemson Agricultural College | 35. University of Houston |
| 18. University of Missouri | 36. MacDonald College |

4. Newsletter.

The national student officers compile and distribute three newsletters to the chartered sections during the year. These involve much work and are very commendably done.

5. Finance.

The cost to AFEA of the Graduate Student Contributed Papers Contest now under study includes awards to three winners of: a certificate, equivalent of a round trip bus fare to the annual meeting from the home institution, \$25.00 subsistence allowance, publication of the winning papers in the Proceedings Issue of *JFE*, and provision of 100 free reprints of it. One student winner this year is from Cornell, hence no transportation cost is involved.

The AFEA defrays the cost of issuing the SS-AFEA newsletter at an estimated cost of \$75.00 per year. Total cost has not yet exceeded this amount but may in future years due to the increased number of chartered institutions and rising costs. This year's cost was \$71.70.

The AFEA also provides funds estimated from \$75-\$85 to finance awards to winners of undergraduate competitions. This year, by purchasing at sales, all awards were purchased at a total cost of \$54.75.

It is recommended that the AFEA continue to allocate \$75-\$90 for the Newsletter and \$75-\$85 per year for undergraduate competition awards.

A. GORDON BALL, *Chairman*
Student Activities Committee

REPORT OF THE AWARDS STUDY COMMITTEE

Background

The Awards Program of the American Farm Economic Association has now operated for nine years. The program was reviewed by a Committee¹ in 1954 and their recommendation recorded in the Minutes of the Executive Committee Meeting, October 5, 1954. Some changes were made in the program at that time. The Proceedings issues of the *Journal of Farm Economics* in 1956, 1957, and 1958 carried further recommendations for improvement of the program as suggested by the chairman, and several chairmen of subcommittees of the Awards Program.

The current Awards Study Committee contacted twelve agricultural economists who have had an active part in the program of past years asking for criticism of the present program and suggestions for possible improvements. These comments have been quite valuable.

Problems

From the various sources of information these major problems are evident:

1. The decrease in the Awards Fund which will necessitate replenishment of this fund in the not too distant future, or the carrying of the Awards Program as a current operating expense of the Association.

2. Difficulties encountered in the judging of some of the material submitted, particularly the wide dispersion among the judges in the rating process.

¹ E. C. Young, O. V. Wells, Harry C. Trelogan, *Chairman*.

3. Ways of handling co-authorships particularly when age limits are involved.
4. Number of awards, amount of monetary awards, and inflexibility of number.
5. Lack of widespread participation in the competition.
6. Possible need to limit number of awards to same individual.
7. Degree of emphasis in program given to the younger group.
8. Insufficient recognition of good research of the problem-solving type in the judging process.
9. Forms of recognition for outstanding contributions in the teaching and extension professions.

Recommendations

It is recommended that the following changes be made in the Awards Program:

A. Awards for Published Research:

Item number four under this on the printed form be amended to read "Eligible recipients must be less than 36 years of age at the time of publication."

B. Awards for Ph.D. Theses:

Item number two under this to be amended as follows:

"An entry must be submitted by the head of the department to which the thesis was presented in partial fulfillment of requirements for a degree. *Each department head may submit one thesis for each eight, or fraction thereof, approved within that department the previous calendar year.*"

C. Award for Best Article in the *Journal of Farm Economics*:

No changes recommended.

D. Awards for Papers Contributed by Graduate Students:

Item number one to be amended "*Either two or three awards, depending upon the total number of papers submitted, will be made for papers submitted by graduate students of any department engaged in training agricultural economists at the graduate level.*"

General Recommendation

The announcements for the Awards Program of each year should be distributed by October 15, so as to give ample time for receiving and processing the entries before the Annual Meeting.

Suggestions for Future Consideration

Since the primary purpose of the Awards Program is to recognize excellence in work, some additional suggestions may be in order for future consideration.

1. It is felt by many that some recognition should be made to those past 36 years of age. These people usually have the experience along with their capabilities and if they are channeled along worthwhile routes, proper recognition would be in order. Perhaps when and if funds become available, this can be done. An appropriately engraved silver tray might be substituted for the monetary awards for this group.

2. Some time ago the book category was eliminated from the published research category with the understanding that it may be established as a separate category. Textbook writing in agricultural economics has not been particularly remunerative but should be encouraged. Thus, it seems advisable for the AFEA

to establish a program to recognize those who do write textbooks. Such a part of the Awards Program might be included every third year.

3. Our professional activity is research oriented, and rightly so, but ways and means should be devised to recognize those more or less forgotten colleagues doing outstanding work in teaching and extension. Perhaps something might be tried for extension first.

AUBREY J. BROWN, *Chairman*
Awards Study Committee

REPORT OF THE AGRICULTURAL DATA COMMITTEE

The Agricultural Data Committee of the AFEA offers the following annual report:

A meeting of the Committee was held at Winnipeg in 1958. A part of the Committee met in Chicago in December of 1958 at the time of the joint meeting with the American Economic Association. The occasion for the Chicago meeting of a part of the Committee was the fact that some livestock data problems were brought to the attention of the group by J. Russell Ives, American Meat Institute, Chicago.

The chairman of the committee has continued to serve on the Census Advisory Committee for Agriculture and has attended all meetings held during the past year. Plans are about completed for the 1959 Census of Agriculture to be taken in October.

The committee has three subcommittees:

(1) the subcommittee on agricultural data needs in Extension, Dorris D. Brown, Chairman.

(2) the subcommittee dealing with requirements for outlook and marketing, J. Carroll Bottum, Chairman.

(3) the subcommittee on agricultural data needs for research, K. L. Bachman, Chairman.

The third subcommittee under the chairmanship of Dr. Bachman has had an active year and developed a section of papers under the title, "Agricultural Data Needs for Research" at which three papers are presented.

Progress has been made by the Committee during the past year, and it is recommended that the Committee be continued for the next year.

WALTER H. EBLING, *Chairman*
Agricultural Data Committee

REPORT OF EMPLOYMENT COMMITTEE

The Employment Committee is again providing a placement service at this Conference to facilitate the meeting of prospective employees and employers. The 1959 Meeting will mark the fifth year that such a service has been provided. The activities of the placement service this year will be changed somewhat from those at past meetings. Access to the files of openings and applications will be more limited this year than has been true in the past. The only individuals who will be allowed to see the job order file will be those who have

filed job applications with the Employment Committee. The only ones who will be permitted to see the application forms of the potential employees will be those who have filed job orders, department heads and representatives of agencies interested in employing people. We hope that limiting access to the files will encourage more people to use the service. Approximately 35 positions and some 55 personnel data forms have been received to date. The Employment Room is Statler Hall, Room W107A.

The suggestion that the Committee publish a list of assistantships and fellowships available to AFEA members was discussed, but no action was recommended.

Consideration also has been given to extending the activities of the Committee to a year-round basis. There appears to be little need for this, especially since members may take advantage of the excellent Placement Register provided at the winter meetings in cooperation with the U. S. Employment Service and allied service associations. Notice concerning this service for the 1958 session was received too late to publish in the *Journal*, but form letters were sent to department heads and others in December describing the Chicago arrangements.

RICHARD A. KING, *Chairman*
Employment Committee

REPORT OF THE RESOLUTIONS COMMITTEE

1. The American Farm Economic Association, beginning its 50th year, wishes to express its sincere appreciation to Cornell University and to the College of Agriculture, both for the excellent handling of the present meeting and for their sustained support and encouragement over the year. Special thanks are due to the members of the Department of Agricultural Economics whose care in developing the detailed arrangements and whose hospitality is much appreciated by members of the Association and their families.
2. We wish to express to the Rural Sociological Society our pleasure for the opportunity to meet jointly with them in this session.
3. This Association extends its good wishes to our confreres in the International Conference of Agricultural Economists, particularly to President Sherman E. Johnson and Executive Vice-President Edgar Thomas, for a successful meeting in Mexico in 1961.
4. For another successful year, the Association also wishes to acknowledge the work of President Bressler and the other officers, and the special committees who have so effectively conducted the work of the Association. We wish particularly to commend A. Gordon Ball, who this year relinquishes his leadership of the Student Activities program. Special commendation is also accorded Robert L. Clodius and the University of Wisconsin for editorial services during the past two years.
5. BE IT RESOLVED, therefore, that these resolutions be placed in the records of this meeting and that the Secretary of the Association be instructed to transmit them to the above individuals and groups.

L. L. BOGER, *Chairman*
Resolutions Committee

MINUTES OF EXECUTIVE COMMITTEE MEETING WINNIPEG AUGUST 21, 1958

Present: Bressler, Trelogan, Bachman, Diesslin, Huffman, Hardin, Hedlund, Sitterly, Clodius, Brown, James, Kearl, Cochrane.

1. Sitterly reported on cataloguing of Ph.D. Theses. It is suggested that an attempt be made to get the subheading "Agriculture" placed under the usual heading "Economics." It was considered doubtful if other changes could be effected. James moved that the Association use its influence to get this done. Passed.

2. Howard Diesslin reported a net increase of 38 members in spite of the increased dues. The sending of personal letters to delinquent members contributed to this success. Diesslin agreed to continue as Chairman of the Membership Committee for the ensuing year.

3. Trelogan reported on the World Agricultural Economics Abstracts. The need for bibliographies of published material in Agricultural Economics has been felt by libraries and departments, both U.S. and foreign. Work is starting on this with the backing of the Council on Economic and Cultural Affairs.

4. Brown moved that the results of the annual elections be announced at the opening session of the annual meetings. Passed.

5. Brown moved that the 1961 annual meeting be joint with the Western Farm Economics Association at Fort Collins, Colorado. Passed. In the discussion of this motion, consideration was given to invitations from Texas, Kentucky, Purdue, Florida, Minnesota, and Colorado. The selection of Colorado was in keeping with a pattern of meetings favoring central locations in the United States, giving due recognition to facilitating attendance by members in different sections of the country, and having a joint meeting with the WFEA from time to time.

6. Hardin offered a resolution to enable Kearl to act, on direction of the Investment Committee, in buying and selling stocks and securities for the Association. Passed.

7. Hardin offered a resolution enabling Kearl to open an account with the Tompkins County Trust Company of Ithaca, New York, for the purpose of depositing funds of the Association, borrowing money as needed and paying bills incurred for the Association. Passed.

8. James moved that the awards program continue as it is and that a committee be appointed to study the program and report to the Executive Committee at its December meeting. Passed. Brown (chairman), Hardin, and Southworth were appointed.

9. It was agreed with the Canadian Agricultural Economics Society that joint dues would be thirteen dollars (\$13) with eight dollars and fifty cents (\$8.50) going to the AFEA and four dollars and fifty cents (\$4.50) going to the CAES.

10. President Andal of the Canadian Agricultural Economics Society reported that that Society wished to pay one-fifth of the expenses of guest speakers to the 1958 annual meetings. This amount is approximately in proportion to its relative number of members. It was moved that this amount be received and that an expression of appreciation be made. Passed.

11. The budget for the 1958-59 year was presented by Kearl and accepted as revised by the Executive Committee.

12. It was moved that the sustaining membership program be continued as it now is. Passed.

13. Bressler presented a proposal by S. A. Robert, Jr., for the American Dairy Association to provide funds for awards on research on milk market development. The general policy of the Association is against highly specific awards but there was some uncertainty as to the ADA proposal. Therefore, it was decided to table the matter as presented and ask Mr. Robert to provide the committee with more definite information.

14. Hedlund discussed plans for the Fiftieth Anniversary Annual Meetings to be held at Cornell University in 1959.

C. D. KEARL
Secretary-Treasurer

MINUTES OF EXECUTIVE COMMITTEE MEETING CHICAGO, DECEMBER 27, 1958

Present: Bressler, Cochrane, Bachman, Brown, Brinegar, Hedlund, Trelogan, Diesslin, Kearl, Clodius.

1. Report by G. W. Hedlund on arrangements for the 1959 Annual Meetings of the AFEA at Cornell University, August 23-26, 1959.

2. President Bressler reported on program arrangements for the summer meetings at Cornell.

3. The Awards Study Committee presented an interim report. The final report is to be presented at the August Executive Committee Meeting. Discussion included the size and nature of the awards.

4. It was suggested that the President-Elect set up his Awards Committee prior to the summer meetings to enable an earlier announcement of the program.

5. George K. Brinegar presented a proposal of a subcommittee of the Committee on Agricultural Economics of the Social Science Research Council, entitled "Reorientations in Agricultural Economics," which included ways and means of getting breadth, continuity and completeness in the discussion of overall agricultural economics research. The need was expressed for focusing on areas that are now being neglected. The subcommittee proposed that a continuing committee of the AFEA be appointed to work on this aspect of the Association activities by considering and recommending research to be done, helping to raise research funds, and allotting these funds as needed to encourage the work. President Bressler was requested to appoint an AFEA committee to work with the Agricultural Economics Committee of the SSRC if requested by the Council.

6. Trelogan moved that Clodius negotiate a surcharge to pay Banta for the added costs of having issues larger than $\frac{1}{4}$ inch in thickness. Passed.

7. Trelogan moved that since reprint costs have increased, Banta should bill us at new rates established in negotiations with Clodius. New prices for billing purchasers of reprints will be Banta's price plus ten per cent. Passed.

8. Trelogan moved that 25 copies of the *Journal of Farm Economics* be sent to the editor to enable the sending of copies of articles to authors. Passed.

9. Because of pressure of work, Robert Clodius requested that he be relieved of the editorship of the *Journal of Farm Economics*. Trelogan moved that Bressler be authorized to obtain the services of a new Editor. Passed.

10. Cochrane moved that the 12 remaining Fellows certificates be kept in the Farm Foundation offices. Passed. It was requested that Joseph Ackerman be responsible for having the names of new Fellows placed on the certificates, getting the signatures of the President and Secretary of the Association on the certificates, having them framed, obtaining information for and preparing citations for the Fellows. The Secretary-Treasurer is to obtain names of candidates for Fellows from the membership, transmit the nominations of the Executive Committee to the Fellows Committee, obtain the names of the new Fellows, transmit this information to Ackerman and to the President, and notify the new Fellows of their nomination.

11. Trelogan reported on the American Dairy Association proposal for AFEA to make an award for the ADA for the outstanding research on milk market development. The AFEA committee, Trelogan, Cochrane, and Hardin, favored the proposal with the limitations that the award be for (1) the general work of an individual and not a specific activity and (2) research in milk marketing and not the narrower area of market development.

Brown moved that the AFEA offer to provide the ADA with (1) help in setting up such an award and (2) judges in deciding the recipient. The award would be given by ADA and not AFEA and would be made at an ADA meeting. Passed.

12. Cochrane moved that the President appoint a committee to explore the possibility of obtaining funds from private groups (for example, the Cotton Council, ADA) to round out and expand the program of awards of the American Farm Economic Association. The expanded program might include awards in special areas of agricultural economics as well as the present general awards. Passed.

C. D. KEARL

Secretary-Treasurer

MINUTES OF EXECUTIVE COMMITTEE MEETING CHICAGO, DECEMBER 28, 1958

Present: Bressler, Cochrane, Bachman, Brown, Kearl, Hardin, Trelogan.

1. Trelogan moved the acceptance of the minutes of the Executive Committee Meetings of August 19, 1958, and August 21, 1958. Passed.

2. Brown moved that a list of the sustaining members be printed in the issue of the *Journal of Farm Economics*. Passed.

3. Nominations by members of individuals for Fellows in the AFEA were considered and a list of candidates was prepared for submission to the Fellows Election Committee. The Secretary-Treasurer was instructed to forward this list to F. V. Waugh, Chairman of the Fellows Election Committee.

4. The Secretary-Treasurer was authorized to buy an additional card file for membership cards at a cost of approximately \$140.

5. The Secretary-Treasurer was authorized to invest the excess of funds in the checking account in such liquid assets as will bring a return and yet permit use of funds as needed.

6. President Bressler will thank the previous investment committee for their services and advice and release them from service.

7. The arrangements with the allied social sciences in the preparation for

winter meetings were discussed. The next winter meetings are to be held in Washington, D.C.

8. President Bressler reported on the progress of the membership campaign.

9. The Student Activities Committee will continue under the chairmanship of Gordon Ball. Aubrey Brown was asked to work with the students program.

10. The need for activity of the Employment Committee at the winter meetings was discussed.

C. D. KEARL
Secretary-Treasurer

MINUTES OF EXECUTIVE COMMITTEE MEETING ITHACA, AUGUST 23-24, 1959

Present members: Cochrane, Bressler, Trelogan, James, Brown, Bachman, Kearl, Nicholls, Koffsky, Hardin.

Ex officio member: Working.

Guests: Clodius, Southworth, Duggan, Ball, Lutz, Carpenter, Fox, Ackerman, Hedlund, Diesslin.

1. The Tellers Report was presented by E. A. Lutz. William Nicholls was elected President-Elect. Lowell Hardin and Nathan Koffsky were elected Vice Presidents for 1959-60.

2. The minutes for the December 1958 Executive Committee Meeting were approved.

3. The report of the Secretary-Treasurer was accepted for presentation at the Annual Meeting.

4. James moved that the membership be reported on a calendar year ending December 31. Passed.

5. Kearl proposed a change of the fiscal year to coincide with the calendar year which is the membership year and the *Journal* printing year. It was decided to postpone action until the winter meeting.

6. James moved to incorporate the special grants funds for the awards program as a part of our regular funds to avoid the need for separate bookkeeping. Passed.

7. A proposal by the Australian Agricultural Economics Society for an arrangement for joint membership or other concessional arrangements was presented. Bressler proposed that a committee be appointed to explore joint membership arrangements.

8. James moved that the report of the Audit Committee presented by K. S. Carpenter be accepted. Passed.

9. Cochrane moved that we continue to have a local audit annually with a CPA audit every third year. Passed.

10. A Local Arrangements Committee report was presented by Hedlund. He agreed to prepare a detailed report for use of the next host institution and the President.

11. Trelogan moved to accept with thanks the report presented by Ivy W. Duggan for the Committee on Sustaining Members. The Secretary-Treasurer was requested to send a list of sustaining members to the Editor for publication in the Proceedings Issue of the *Journal of Farm Economics*.

12. Cochrane moved that the members of the Executive Committee give the President the names of possible members of the Sustaining Members Committee. A statement of the activities and aims of the Association which is suitable for soliciting sustaining members is to be prepared. The President will appoint a larger Sustaining Membership Committee. Passed.

13. James moved that the report of the Agricultural Data Committee be accepted. Passed.

14. Trelogan moved the acceptance of the report of Robert Clodius as Editor of the *Journal of Farm Economics*. Passed.

15. Trelogan moved that the Editor continue the practice of supplying tear sheet reprints to JFE authors. Passed.

16. Southworth reported on the transfer of the Editor's office.

17. James moved that we endorse the idea of contributed papers and agree to publish an abstract of not over one page in the *Journal* for those accepted for presentation and submitted for publication. This does not obligate the President to have contributed papers. Passed.

18. The report of the Employment Committee was given by Richard Aplin. Trelogan moved the acceptance of this report. Passed. A suggestion that special arrangements be made for employers wishing to make general interviews for employment, presented by Aplin, was endorsed.

19. Trelogan moved acceptance of the Investment Committee report. Passed.

20. Trelogan moved that the Investment Committee be authorized to invest between \$5,000 and \$7,000 in stocks or bonds as seems wise. Passed.

21. Diesslin reported on Membership Committee activities. Effort was primarily in the western areas of the country. The work of the committee was done by committee members covering areal divisions of the country.

22. The possibility of a supplement to the Directory was discussed. There was opposition to this idea, but it was felt that a new Directory is needed every five years. Trelogan moved that a committee be appointed to draw up plans for the publication of a new Directory. The committee is to report at the December meeting. Passed.

23. Diesslin reported on the finances of the winter meeting.

24. Trelogan moved that the Report of ICA Corresponding Memberships presented by Kearn be accepted. The President is to appoint a person to contact ICA regarding the program. Passed.

25. Trelogan moved that the report of the subcommittee on Student Affairs presented by Ball be received with thanks. Passed.

26. An information report on New Orientations in Research was presented by Southworth.

27. Bressler discussed the Kutish Case and will present a report to the members at the Annual Meeting.

28. Southworth reported on the awards for 1959. Trelogan moved that the report be accepted. Passed.

29. Brown moved that the Awards Study Committee report be received. Passed.

30. Cochrane reported on the appointments to the Awards Committee.

31. James moved that a man may not be permitted to receive an award in the same category more than once every three years. Passed.

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32. Brown moved that the rules for awards for the Ph.D. thesis be changed to read: "An entry must be submitted by the head of the department to whom the thesis was presented in partial fulfillment for requirements for a degree. Each department head may submit one thesis for each eight, or fraction thereof, approved within that department the previous calendar year." Passed.

33. James moved that the present awards for papers contributed by graduate students be discontinued and in its place a Master's Thesis Award program of not more than three awards each year of \$100 for each award be substituted. Passed.

34. Brown moved that the announcements of the Awards Programs of each year should be distributed by October 15, so as to give ample time for receiving and processing the entries before the Annual Meeting. Passed.

35. Brown moved that the "suggestions for future consideration" included in the reports of the Awards Study Committee be passed on to the next year's committees for further action. Passed.

36. Invitations for the Annual Meetings of the Association were received as follows:

New England Agricultural & Economic Council (at Connecticut)	1962
University of Wisconsin	1962 or 1963
University of Minnesota	1963
University of Maryland	1962
Purdue University	1962 or 1963
University of Kentucky	any year
University of Florida	any year

In view of the scheduling of 1961 and 1963 winter meetings in New York and Boston, Bressler moved that the Annual Meeting in 1962 be held at the University of Maryland providing there is a USDA centennial celebration and subject to confirmation at the winter meeting. Passed.

37. Cochrane reported on the arrangements for the Winter Meetings at Washington, D.C.

38. Cochrane reported on preliminary arrangements for the 1960 Annual Meetings.

39. Kearl presented a proposed budget. It was approved as amended.

C. D. KEARL

Secretary-Treasurer

MINUTES OF THE ANNUAL BUSINESS MEETING

ITHACA, AUGUST 25, 1959

1. President Raymond Bressler called the meeting to order at 8:40 a.m. in Warren Hall. He presented his Annual Report on the progress of the Association.

2. The Secretary-Treasurer's report by C. D. Kearl was accepted.

3. The Auditor's report was presented by K. S. Carpenter and was accepted.

4. The report of the Editor was presented by Robert Clodius and was accepted.

5. Gordon Ball presented a report for the Committee on Student Affairs. The report was accepted.

6. President Bressler turned the meeting over to the new President, Willard Cochrane.

7. Announcement was made of arrangements for the Washington, D.C. meetings in December and the summer meetings to be held at Iowa State University, August 10-13, 1960.

8. The Resolutions Committee report presented by Laurence L. Boger was accepted.

9. H. C. M. Case moved that the incoming President and Executive Committee give consideration to the possibility of supporting reestablishment of the Bureau of Agricultural Economics. Passed.

10. It was moved and passed that the Executive Committee consider the feasibility of the Association preparing a cumulative index of the JFE.

11. Hardin discussed the proposal of the publishing of a Directory in 1961.

12. The meeting was adjourned.

C. D. KEARL
Secretary-Treasurer

COMMITTEES OF THE AMERICAN FARM ECONOMIC ASSOCIATION, 1958-59

Executive Committee

President	R. G. Bressler, University of California
President-Elect	W. W. Cochrane, University of Minnesota
Vice President	A. J. Brown, University of Kentucky
Vice President	K. L. Bachman, Agricultural Research Service, U.S.D.A.
Secretary-Treasurer	C. D. Kearl, Cornell University
Past President	H. C. Trelogan, Agricultural Marketing Service, U.S.D.A.
Past President	H. B. James, North Carolina State College

Ex-officio Members:

M. E. Andel, President, Canadian Agricultural Economics Society
R. E. Huffman, President, Western Farm Economics Association

Journal of Farm Economics

Editor	R. L. Clodius, University of Wisconsin
Associate Editor	W. F. Mueller, University of Wisconsin
Book Review Editor	G. G. Judge, Oklahoma State University

Editorial Council:

M. A. Abrahamsen, Farmer Cooperative Service, U.S.D.A.
J. N. Boles, University of California
A. Erikson, Oscar Mayer Co.
D. E. Hathaway, Michigan State University
W. H. Nicholls, Vanderbilt University
R. W. Rudd, University of Kentucky

R. C. Scott, Federal Extension Service, U.S.D.A.
H. M. Southworth, Pennsylvania State University
B. F. Stanton, Cornell University
H. A. Steele, Agricultural Research Service, U.S.D.A.
E. R. Swanson, University of Illinois
A. H. Turner, Department of Agriculture, Canada

Awards Committee

H. M. Southworth, Pennsylvania State University (Chairman)

Subcommittee I—Published Research:

J. C. Bottum, Purdue University (Chairman)
E. T. Baughman, Federal Reserve Bank of Chicago
H. F. Breimyer, Agricultural Marketing Service, U.S.D.A.
G. K. Brinegar, University of Connecticut
M. Clawson, Resources for the Future, Inc.
D. B. DeLoach, University of California
H. R. Jensen, University of Minnesota
W. O. Jones, Stanford University
R. J. Penn, University of Wisconsin
M. D. Woodin, Louisiana State University

Subcommittee II—Doctoral Dissertations:

G. G. Judge, Oklahoma State University (Chairman)
J. N. Boles, University of California
J. M. Brewster, Agricultural Research Service, U.S.D.A.
G. S. Shepherd, Iowa State University

Subcommittee III—Student Activities:

A. G. Ball, Iowa State University (Chairman)
J. C. Gilson, University of Manitoba
H. W. Halvorson, University of Wisconsin
R. J. Hildreth, Texas A & M College
F. H. Wiegmann, Louisiana State University

Subcommittee IV—Special Study of Awards Program:

A. J. Brown, University of Kentucky (Chairman)
L. S. Hardin, Purdue University
H. M. Southworth, Pennsylvania State University

Subcommittee V—Proposals for New Awards:

H. C. Trelogan, Agricultural Marketing Service, U.S.D.A. (Chairman)
W. W. Cochrane, University of Minnesota
L. S. Hardin, Purdue University

Committee of Fellows

F. V. Waugh, Agricultural Marketing Service, U.S.D.A. (Chairman)
J. D. Black, Harvard University

A. Hobson, Blue Mounds, Wisconsin
W. I. Myers, Cornell University
T. W. Schultz, University of Chicago

Employment Committee

R. A. King, North Carolina State College (Chairman)
R. D. Aplin, Cornell University
R. Bird, University of Missouri
D. B. DeLoach, University of California
W. E. Folz, University of Idaho
L. F. Herrmann, Agricultural Marketing Service, U.S.D.A.

Agricultural Data Committee

W. H. Ebling, University of Wisconsin (Chairman)
G. H. Aull, Clemson Agricultural College
K. L. Bachman, Agricultural Research Service, U.S.D.A.
F. V. Beck, Rutgers University
J. C. Bottum, Purdue University
D. D. Brown, Skaneateles, New York
G. G. Judge, Oklahoma State University
K. E. Miller, Armour and Co.
P. Raup, University of Minnesota
R. E. Seltzer, University of Arizona
E. C. Wilcox, Agricultural Marketing Service, U.S.D.A. (Seattle)

Investment Committee

J. Ackerman, Farm Foundation (Chairman)
E. T. Baughman, Federal Reserve Bank of Chicago
C. D. Kearl, Cornell University
W. I. Myers, Cornell University

Membership Committee

H. G. Diesslin, Farm Foundation (Chairman)
K. L. Bachman, Agricultural Research Service, U.S.D.A.
A. J. Brown, University of Kentucky
C. D. Kearl, Cornell University
R. E. Olson, Agricultural Marketing Service, U.S.D.A.
O. Ray, American Feed Manufacturers Association

Sustaining Membership

I. W. Duggan, Trust Company of Georgia (Chairman)

Program Committee—1958 Winter Meeting

R. G. Bressler, University of California (Chairman)
H. C. M. Case, University of Illinois
R. L. Clodius, University of Wisconsin

H. G. Diesslin, Farm Foundation
G. M. Kuznets, University of California
G. L. Mehren, University of California

Program Committee—1959 Annual Meeting

R. G. Bressler, University of California (Chairman)
K. L. Bachman, Agricultural Research Service, U.S.D.A.
N. R. Collins, University of California
J. C. Doneth, Michigan State University
W. H. Ebling, University of Wisconsin
M. E. John, Pennsylvania State University
G. L. Mehren, University of California
V. W. Ruttan, Purdue University
S. K. Seaver, University of Connecticut
R. L. Tontz, Foreign Agricultural Service, U.S.D.A.

Nominating Committee

R. G. Bressler, University of California (Chairman)
H. B. James, North Carolina State College
H. C. Trelogan, Agricultural Marketing Service, U.S.D.A.

Committee on New Orientations in Research

H. M. Southworth, Pennsylvania State University (Chairman)
K. L. Bachman, Agricultural Research Service, U.S.D.A.
G. K. Brinegar, University of Connecticut
R. L. Clodius, University of Wisconsin
S. S. Hoos, University of California
H. B. James, North Carolina State College
M. Nerlove, University of Minnesota
W. H. Nicholls, Vanderbilt University
H. C. Trelogan, Agricultural Marketing Service, U.S.D.A.

Audit Committee

T. N. Hurd, Division of Budget, State of New York (Chairman)
K. S. Carpenter, Cornell University

Tellers Committee

E. A. Lutz, Cornell University (Chairman)
R. B. How, Cornell University
B. F. Stanton, Cornell University

Fiftieth Anniversary Committee

L. W. Witt, Michigan State University (Chairman)
O. C. Stine, Shepherdstown, West Virginia
S. W. Warren, Cornell University

Committee on Arrangements—1959 Annual Meeting

Executive Committee

G. W. Hedlund (Chairman)

C. A. Bratton

C. W. Loomis

J. F. Metz

R. S. Smith

B. F. Stanton

S. W. Warren

Staff, Agricultural Economics Department, Cornell University

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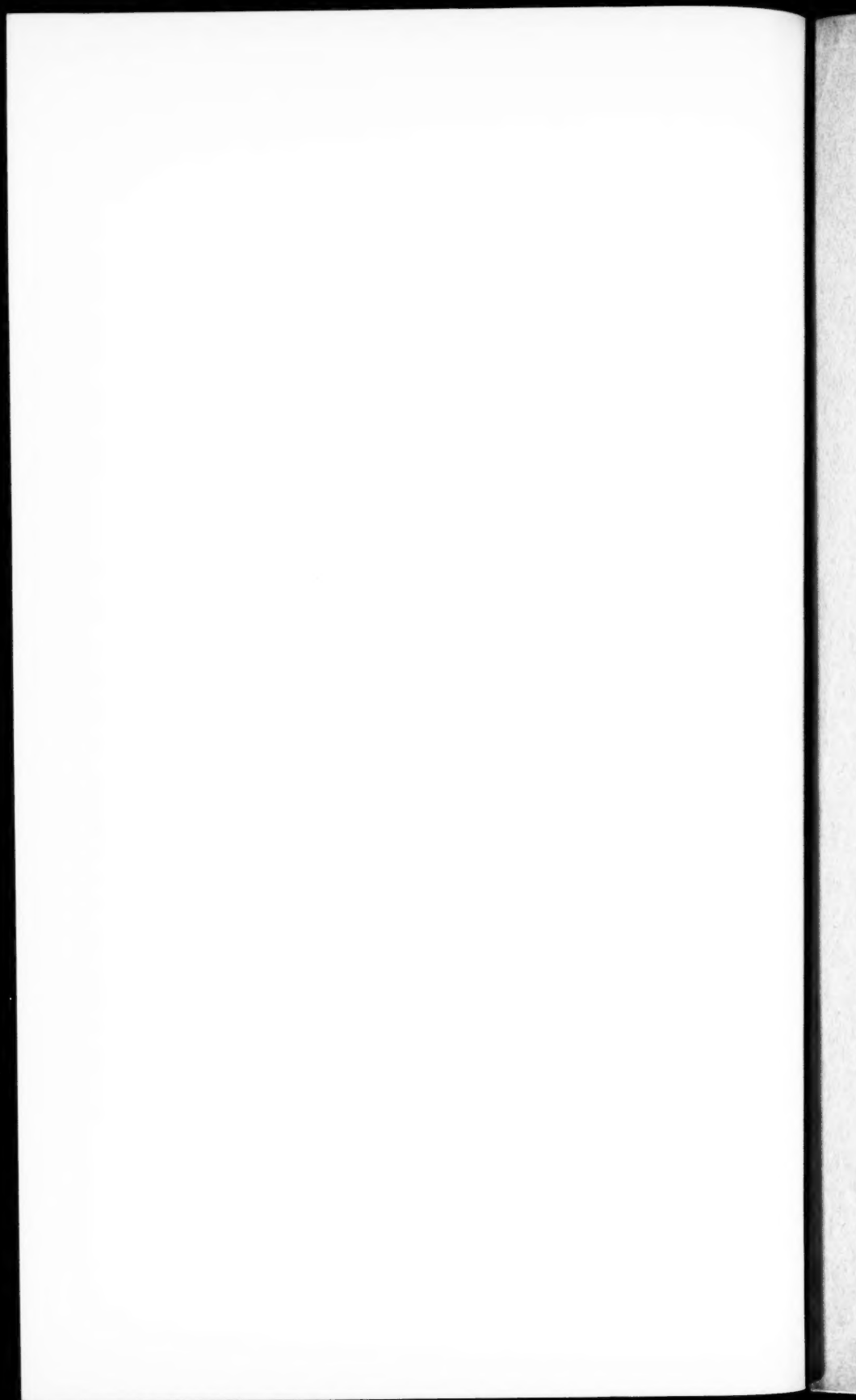
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